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IMPROVED COFFER DAM.

This invention is a portable coffer dam of a construction which offers improved facilities for the excavation of tunnels, building of bridge supports, piers, sea walls, or other marine structures. It is formed of watertight compartments which, when the apparatus is to be towed from one point to another, are filled with air only; but when it is desired to locate the dam, water is admitted into the sections, causing the entire structure to sink and rest on the bottom. The principal feature of the invention is the system of plate piles which surround the interior sides, and which may be forced down below the bottom of the dam and into the mud for a considerable depth. These, besides, enable the apparatus to conform, in its lower portion, to the irregularities of the bed, and thus tends greatly to prevent the infiltration of water.

The large engraving, Fig. 1, represents the dam in position for the construction of a pier, the dotted lines indicating the depth of the structure. The forward portion is shaped somewhat like the bow of a vessel, by connecting together two hinged gates, formed of metal, and each constituting a compartment similar to those into which the body of the dam is divided. The rear portion of the structure is provided with similar doors, made so as to secure and fit tightly against the sides of the pier end, being secured by screw clamp rods, which embrace the ends of heavy posts.

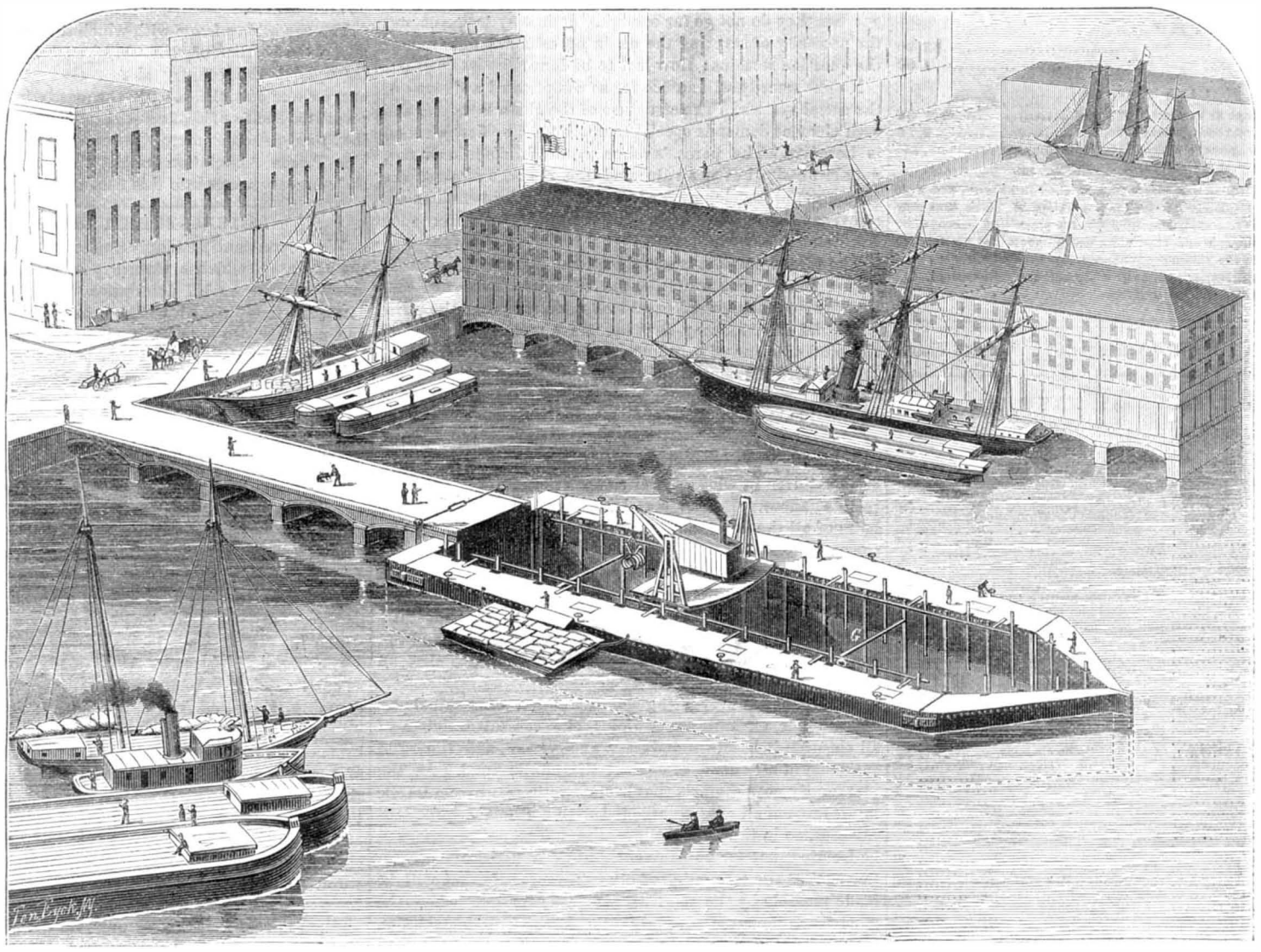
The manner in which the body is constructed in sections is shown in Figs. 2 and 3. In the latter engraving are represented the rear gates, at A; and at B, in both figures, are the valves which admit water to the compartments to sink the same. At C, Fig. 2, are the plate piles, which are raised or lowered by the screws attached to their upper portions. D are the holding piles, which are guided by, and slide upon, T irons that are secured to inner plating of the body. Extending around and underneath the middle portion of the latter is a keel, E, which serves to take a firm hold in the bottom, thereby giving greater security to the structure.

On top, and secured parallel to the decks and over the open middle portion, a track is laid, to support a dredge and pile drivers which travel thereon. Lastly, clamping bars extend across the inner part at G, Fig. 3, and at other points, serving to bind the sides together and give solidity to the fabric.

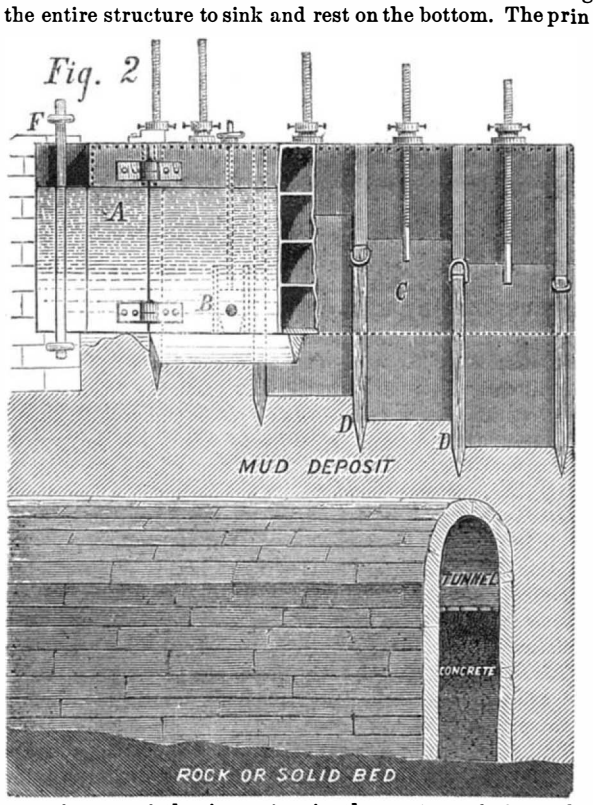
In order to prepare the dam for pier or tunnel building, the sheet and square piles are first raised so that their lower edges and ends will be above the bottom of the sections. The latter being empty, the dam is easily floated to the desired point, where it is sunk as already described. The square piles are then forced into the earth to form a solid bearing, the sheet piles being driven in until bed rock, if necessary, is reached. The water in the middle space being pumped out, the building operations may be begun at once, and, if a pier, the work carried on until the entire space is filled. To extend the masonry further out into the water, the piles are raised, and the dam floated and towed ahead until its rear gates embrace once more just the extremity of the structure, when the dam is again sunk and the work continued The advantage of building the dam in two sections clear of the decks, returning the same on top of the tunnel arch, as shown in Fig. 2, after the mason work is finished.

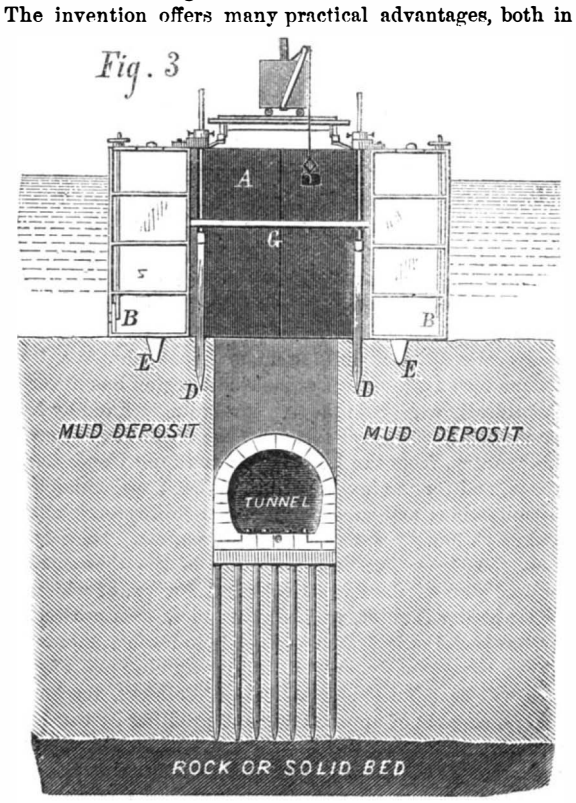
The invention offers many practical advantages, both in point of economy and convenience, which will doubtless be evident to engineers generally.

The two engravings, Figs. 2 and 3, also show the two methods by which, the inventor suggests, a tunnel by the aid of



WALSH'S COFFER DAM.





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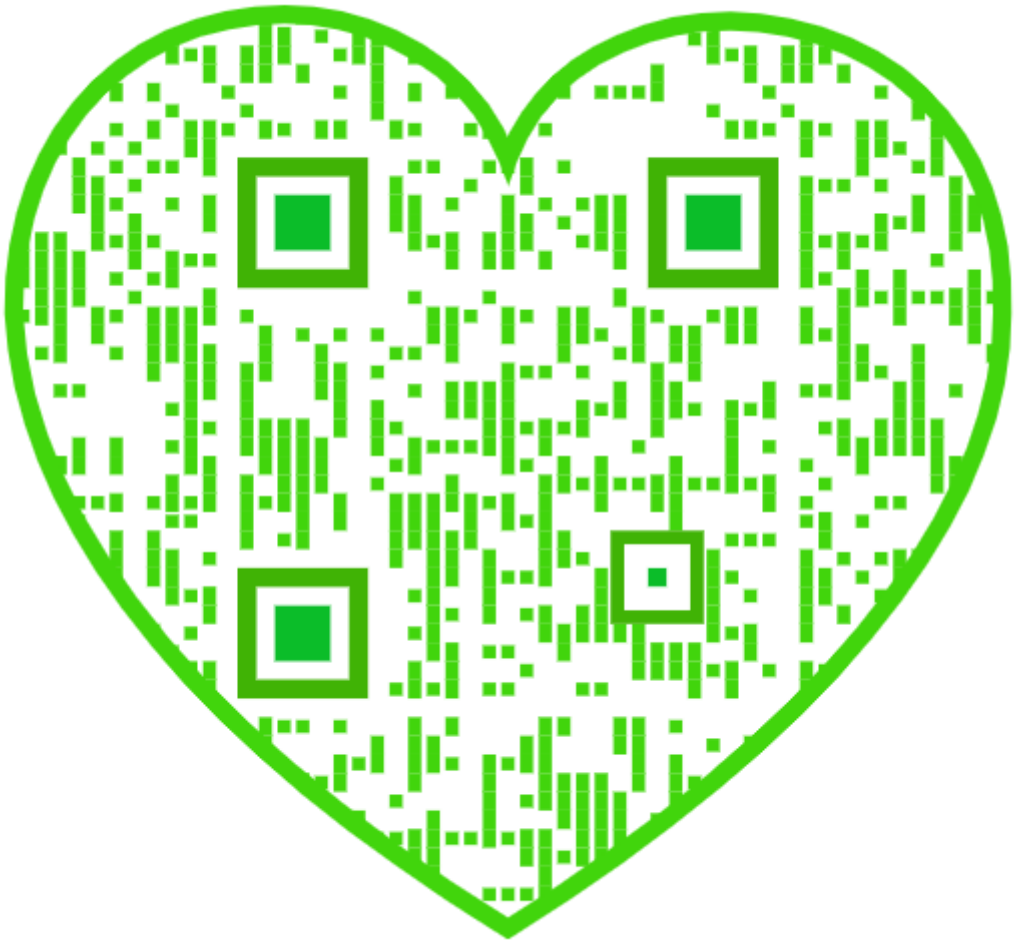

his apparatus may be constructed. In Fig. 2, piles are driven down into the mud, etc., until their lower ends meet hard pan, and above them the masonry of the tunnel is built, as shown, concrete being placed over all. The other plan, in Fig. 3, involves digging down directly to bed rock, and building masonry therefrom upward, filling in the lower part with concrete, up to the desired level of the tunnel floor.

The invention is covered by four separate patents, granted to Mr. John E. Walsh, of 333 West street, New York city, to whom inquiries for further particulars may be addressed.

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AN INLAND PENIKESE.

The success of the School of Natural History at Penikese is an encouraging indication of the growing demand for truly scientific teaching. Another indication is the favor accorded to Professor Shaler's project for an inland school of observation, to be located in the coming summer near Cumberland Gap, Ky.

Several conditions unite to make the site chosen a favorable one for an out-of-door school. The region has never been scientifically explored: the Gap is admirably fitted by Nature for the study of a great section of the fossil-bearing rocks of this country, from the Lower Silurian to the Upper Carboniferous, and for the investigation of the Appalachian system of mountains; and subsistence is incredibly cheap, milk ten cents a gallon, eggs five cents a dozen, etc. Last, but not least, the cöoperation and assistance of the thoroughly organized staff of the State Geological Survey, of which Professor Shaler is chief, will be given to the enterprise.

The special object of the school is to teach students to observe; consequently only a limited number (25) of picked men will be admitted—graduates of colleges, teachers and others, capable of appreciating and profiting by the instruction given. Among the instructors will be Dr. Asa Gray, Professor J. D. Whitney, Rafael Pumpelly, and others, besides the members of the State Surveying Corps. The various departments of geology will be chiefly studied, but only with a view to the elucidation of the problems presented by the area under exploration. Some attention will also be given to the zöology and botany of the district.

As might have been expected, the applications have been far in excess of the number that can be accepted. If successful—and it can hardly fail to be—this camp school is likely to become a permanent institution, with a new camp ground every year.

THE CHAIN OF CRIMINAL ENTAILMENT.

Having studied crime and criminals for thirty years, the New York State Prison Association concludes (in its annual report, just presented to the Legislature) that to reduce the criminal classes and break up the entailment of the evils of pauperism and crime, "which defy remedies and curative discipline in adult lives," two things are specially required, namely to sever the links in the chain of such entailed evils, and to instruct, train, and save all the children.

To use a homely saying, it is saving at the spigot and wasting at the bung to attempt the repression of crime solely through action upon adult criminals. So long as the chain of criminal entailment is unbroken, the most searching and rigorous police system possible is powerless to purge the community of evil acts and evil tendencies.

The judgments of the association are sound, so far as they go: but they do not go far enough. It is easy to point out the necessity of severing the chain of criminal entailment; the question remains: How is it to be done?

No one remedy will suffice for so complicated a disease of the social system. The structure of the chain is triple, and each element demands special treatment. The first element is heredity. The parent's crime is the child's inheritance, not absolutely, but as a rule; and the chances against the proper moral development of the progeny of the vicious are so overwhelming that it were better for the world were such children never born.

The second element is miseducation. By conscious teaching or unconscious example, the criminal classes are continually corrupting the honest and contaminating the pure The child of virtue may thus become a monster of vice and the head of a line of evil doers.

The third element is what we may call moral atavism. Constitutional virtue is the product of long culture, the fruit of moral habits covering many generations. Yet, as in herds of blooded stock there will be an occasional reversion to the primitive type, so in good families there will now and then arise children in whose moral composition the barbarism of remote ancestry strangely dominates. Instead of being heirs of all the ages, such unfortunates inherit only savagery.

What the causes and conditions of such reversions are, no one knows, though the fact is painfully patent in the "black sheep" which afflict so many domestic flocks, boys and girls who turn out badly in spite of virtuous parentage and the most careful education. Time alone can cut off or dry up this source of crime.

The means for preventing the production of criminals by education or example are twofold: The careful training of all children in habits of industry and virtue, and the rigid seclusion of all offenders against the public weal. As the community now compels the absolute retirement from public intercourse of all persons afflicted with malignant infectious diseases, so in time, we believe, the morally diseased will be isolated, not for punishment, but as a necessary precaution against the corrupting of others: a measure that will be made possible by the relative rareness of crime when the most fruitful source of criminality--hereditary transmission—shall have been dried up.

Herein lies the great problem of prison management, to isolate the evil-disposed so as to prevent depredations against the life and property of the law-abiding and the moral purity of youth, while making the criminal classes self-supporting and, at the same time, furthering so far as possible their reclamation to paths of virtue. On these points the views of the association show an encouraging progress toward what we have heretofore styled the scientific treatment of criminals.

Touching hereditary crime, the suggestions of the association are palliative merely. Given children born with a criminal bias, the best thing undoubtedly is to counteract, so far as may be, their evil tendencies by proper training in childhood and moral surroundings in later years. So far, good: but the time has come when preventive measures also should be considered. Is it possible to lessen the number of the inheritors of crime-compelling organizations by making their generation less frequent? In plainer words, can the community prevent known criminals from completing the chain of criminal entailment?

X, a male, and *Y*, a female, are convicted criminals, come of criminal parentage. In all human probability their children will be criminals. Has the community any right to allow the future to be afflicted with their pernicious progeny? We say: No, no more than they should be allowed to erect a house or build a dam in such a way as to imperil life and property ten years hence. That the resultant evils can be prevented in the one case as surely as in the other (not absolutely, but very largely), we are confident. The question is: Which of the several possible ways of doing it is most consistent with our modern views of what is just and profitable?

The summary execution of criminals of every grade would soon put an end to hereditary crime: so too would the Spartan custom of killing all suspicious or undesirable infants. But these remedies are so horrible, so obnoxious to our moral sentiments and sense of justice, that they are not to be thought of. Two other methods remain: To set apart all criminals permanently, in communities or colonies, with the sexes separated, as lepers are treated in the Sandwich Islands or to eliminate their power of propagation, as suggested in our article on the generation of the wicked.

So long as the criminal classes are so numerous, their isolation is beset with many difficulties. The crime committed, not the character or moral needs of the criminal, determine the period of his seclusion. To sever the chain of heredity, the convict's imprisonment would have to befor life, regardless of the severity of his crime or the thoroughness of his subsequent reformation. This would require the capacity of the penal colonies to be immense and very burdensome to the innocent, since it would be only under peculiarly favorable circumstances that the isolated communities could be made self-supporting. Nevertheless prisons and penal colonies will always be needed, if not for punishment, at least for the separation of the criminally infected from the morally healthy, for the safety of youth.

Use would be found for them also as alternatives to the last named plan for breaking up the entailment of crime. The criminal might have the choice of the two preventives of heredity, loss of freedom with sexual isolation, or the enjoyment of civil liberty with sexual impotence. In either case the terrible stream of criminal entailment would largely cut off at its source.

The surprising favor with which the suggestions made in "The Generation of the Wicked" have been received throughout the country shows that thoughtful men are everywhere dissatisfied with the costly insufficiency of our present methods of dealing with crime, and convinced that they need to be not merely reformed but radically changed. The Prison Association might find it profitable to push their investigations into this field of inquiry also.

PICTURES BETTER THAN STORIES.

We are constantly endeavoring to impress upon our readers the advantage which a picture possesses, either as a direct substitute for verbal description or as explanatory of the same. A rough sketch will, in nine cases out of ten, convey one person's idea to another more clearly than pages of labored, written details; and this is why we ask people who send us questions about machines, or mathematical or mechanical problems, to use their pencils as much as possible; while we counsel others who cannot sketch to acquire some knowledge of that very useful accomplishment. Time is a very valuable commodity; and the mechanic or professional man, whose leisure time is seldom great, has little liking for poring over a long description when half a dozen lines, in the form of a sketch, will enable him to seize the gist of the idea in perhaps as many seconds. This is one of the reasons why we advise the inventor, who has a new idea to show to the world, to exhibit it by a picture whenever possible, and to distribute that picture widely among the people whom his production is likely to interest.

The value of pictures, or rather their superiority over words, as story tellers, is excellently illustrated by a couple of incidents which we find related in a foreign contemporary. In a village in India, recently, it became necessary in the course of some engineering operations to transport an enormous mass of metal, weighing several hundred tuns, from one point of the town to another. Ordinary means were out of the question; and as the engineers found themselves unable to devise any process, they did the next best thing, and wrote to other engineers in England who were constantly supervising such work. The latter, instead of writing out nice large pages of foolscap, beautifully embellished with Greek letter formulæ and red ink, quietly waited until the next big piece of metal which they had to transport offered a favorable opportunity. Then they prepared a camera, and photographed every step of the operation, together with all the tools and appurtenances and forwarded the prints from the negatives to India. These the engineers in the far-off country followed, and with little difficulty accomplished their task.

Another instance is that of a bridge, also to be constructed in India but not yet completed. This work involves the placing of very heavy weights and certain difficulties incident to the rapid changes of level of the water to be crossed. At the present time just such another bridge is in process of erection in London, and the assistance of photography is again called in. As the London bridge advances toward completion, photographs are constantly made; and so when the Indian engineers begin their work, they will be in possession of a set of guides of invaluable assistance to them.

SOME CURIOUS RESULTS OF EXPERIMENTAL SURGERY.

The power of the lower forms of animal life to withstand mutilation is well known. Cut an angle worm in two, and the tail end will reproduce the head and the head a tail. Other worms may be cut into many pieces and each fragment will straightway develop a complete worm. A polyp will endure decapitation a score of times, a new head growing on every time. In like manner, the stomach of one of these creatures is capable of developing all the other parts. Still lower in the scale, the normal method of multiplication is by division, and elementary cells of more highly differentiated organisms seem to retain more or less of the primitive character. By virtue of this inheritance, spiders reproduce their lost limbs and crabs their claws. In the higher forms of life, the power diminishes so far as complex organs are involved; still it is retained to a much greater degree than is commonly supposed.

Pull out a hair or a finger nail, and it will grow again. Remove a portion of the skin and it will be renewed, unless the wound is too broad or the life of the surrounding parts too feeble. Even then it is possible to transplant to the denuded surface minute particles of skin from other parts, and in a short time these epidermic islands will extend their borders until the wound is covered and the sore heals with scarcely

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a scar. In like manner a severed finger may be made to grow together again, and an amputated nose built up in form with live flesh from the cheek.

In such cases muscular fibers as well as skin are restored or reunited by internal growth. This may be observed also wherever a deep cut is healed. It has been found, too, that the muscular tissues which perform involuntary motions in the interior of the body possess the same power of self-restoration. It is this recuperative faculty which enables the cattle of Abyssinia to supply their barbarous owners with steaks without losing their lives. The hungry savage throws his ox upon the ground, makes a cross cut in the skin of the flank, lifts the skin and cuts out a chunk of beef for his dinner, replaces the skin, and drives on rejoicing, trusting to internal growth to restore the mutilated part to health and soundness.

In every wound of the skin or muscle, nerves are severed. The restoration of the functions of feeling and motion, with the progressive healing of the wound, shows that the nerves are likewise capable of reparation. The renewal of nerve connection has been watched in cases, where, as is sometimes necessary, a section of a large nerve has been cut out. In a couple of months after the nerve is cut, a gray lump appears on one extremity of the severed nerve. Growth proceeds towards the opposite nerve end until a new connection is made, at first more slender than the original; but by degrees the nerve elements increase in size and whiteness, until, in from four to six months, the nervous cord is fully restored. This process, it is said, goes on even when two inches of nerve has been excised.

About a dozen years ago it was demonstrated that cartilage, formerly supposed to be incapable of renovation, was also subject to the same laws. The cartilaginous tissue of dogs and rabbits was divided, and at the end of two months was found to be completely restored. Similarly the tendons by which muscles are attached to bones are able to reunite when severed or torn out: a fortunate circumstance for a prominent clergyman of this city, whose *tendo Achillis* was suddenly snapped while walking along the street one day last winter, thus making his foot temporarily useless. Thanks however, to the gradual reunion of the tendon, the crippled limb will in time be restored to usefulness.

Still more remarkable is the restoration of bones, and even the development of bones in abnormal positions by the transplanting of the periosteum, the membrane surrounding bony structures and the principal agent in elaborating them. Formerly, in case of a badly shattered or diseased bone, the amputation of the limb was the only resource. Now the skillful surgeon excavates the damaged parts; and in a few months the limb, which has never lost its form, repairs its losses, and regains its strength. Attempts have also been made to graft healthy bones in place of diseased ones, but they have fallen short of perfect success. The transplanting of teeth has been more successful, and partial success has attended the reproduction of teeth by a sort of budding process. In its natural development, a tooth springs from a little bay or follicle, containing an organ or germ for the production of the ivory of the tooth and one for the enamel. The entire follicle taken from a puppy and grafted into the jaw of an adult dog continues its development, and a perfect tooth is the result. Doubtless the same would occur in human jaws, and possibly the dentist of the future will be prepared to set the germ of a new tooth in the place of each one he extracts, giving the patient a choice of the whole range of mammaliar dentition!

Among the curiosities of this sort of surgery, we may mention the trumpet-nosed rats with which a waggish student puzzled the naturalists of Paris. By grafting the tip of one rat's tail into the snout of another rat, he produced a nondescript creature with a trumpet-shaped proboscis, for which it had no use; yet the connection of the nerves and blood vessels was complete, and the sensibility of the part so keen as to preclude the idea of mechanical attachment. Similarly cock's combs have been furnished with teeth and spurs by transplanting.

THE RECENT REMARKABLE PROGRESS IN THE STEEL INDUSTRY.

We are inclined to believe that very few of our readers have any idea of the immense progress which has been made in the steel industry in this section of the country during the past few months. When we state that American pig has been obtained as low as $32 per tun, from which the rails produced included but one per cent of second quality, as against imported pig at $65 per tun, which yielded from ten to twelve per cent of second quality rails, eighteen months ago, we need hardly point out that competition, under these conditions, is out of the question, and that the foreign metal in our markets bids fair to lose whatever footing it may still possess. Add to the above that, with the exception of such as has been necessary to complete old contracts, no English rails have been imported into this country for some nine months, and that the importation has without doubt ceased for ever, that the Grand Trunk Railway of Canada, whose president and many of whose directors are heavy stockholders in the great Barrow plant, have found it to their interest to order 6,500 tuns of rails from the works in Troy, N. Y., rather than send to England, and that 120,000 tuns of ore, from which steel can be at once produced, with anthracite coal and without admixture of other ores, can be annually mined at the Crown Point mine in this State; and perhaps we have adduced sufficient instances to bear us out in the view that the steel production of this country is rapidly advancing toward a point of close competition with that of Great Britain.

It is well to bear in mind that the extraordinary strides which we have indicated have mainly taken place since the exploitation of the Crown Point mine, near Lake Champlain, in New York State, and have been aided by the consolidation of the two great iron-making establishments of Troy, formerly under the control of Messrs. Erastus Corning and John A. Griswold, into one great corporation, now known as the Albany and Rensselaer Iron and Steel Company. The ore of the mine above mentioned is of singular purity, and so well adapted for steel making that it finds a market in the heart of the Pennsylvania iron district, no less than 40,000 tuns being sent thither during the present year. The Port Henry product yields seventy per cent in the furnace, and the deposit is seemingly inexhaustable. The ore, however, is not capable of being smelted into steel. There is a single wall, 225 feet high by 300 feet face, of ore, while the roof is supported by pillars of ore, each containing from sixty to seventy-five thousand tuns. Upwards of $2,000,000, we are informed, have been spent in developing these resources.

The consolidated works above mentioned use up about 100,000 tuns of pig metal yearly, and can produce about 24,000 tuns of the same from their own furnaces. Their coal expenditure is in the neighborhood of 150,000 tuns.

The melting of pig for conversion is about 300 tuns per day, and the product of steel rails 1,100 tuns, or two and a half miles, per week, two five tun converters literally turning out as many ingots in weight as is accomplished in Barrow with seven converters of like size. The metal is cast in ingots weighing a tun each, and from the time it leaves the cupola it never stops until it results in a finished bloom. Hammers are abolished and rolls substituted, and herein lies one of the important causes of the reduced cost and improved quality of the product. The latter is, by the drawing in lieu of the pounding process, rendered far more homogeneous and far more uniform throughout; while the celerity of the operation, due to the novel machinery which has been introduced, is certainly most remarkable. Each ingot makes three rails, and the bar, which on entering the rolls is thirteen inches square, is reduced to six inches in a single heat. The time occupied by the steel in changing from the bloom to a finished rail is one minute and thirty seconds. It is impossible, within the limits of this article, to describe the tables on which the metal is lifted, or the automatic fingers which turn it to present it to the rolls, or, indeed, any of the ingenious mechanism which reduces the labor of eighteen men to that of one man and a boy, and handles the great masses as if they were feathers. This we reserve for a future time, when the pencil of the artist can aid our explanation, and when we shall be enabled to tell how ingots weighing two tuns instead of one are as deftly manipulated. The cost of making the pig is about $32 per tun, and from this steel, worth $75, a sum which allows the manufacturer a fair profit, comes in competition with the English production, for which $95 is demanded on this side of the water.

The facts which we have mentioned will appear to many incomprehensible when the unsettled condition of labor in Troy for some time past is recalled. This state of affairs certainly renders the circumstances all the more remarkable, for that which has been done has been accomplished in the face of strikes, and during the prevalence of trade union intimidation, when reliable workmen were few and far between. In all the great works above mentioned, not a union man is employed. Abnegation of trade societies is a rigid condition upon those hired. As a result, skilled labor has had to be manufactured.

Brains and the green hands did what we have told; skilled labor found itself for once unable to overcome its employers as it did in Pittsburgh, and skilled labor, in the persons of the trades unions, went to the wall. Meanwhile the day laborers, the carpenters, the bakers, and who not, collected in the great plant, have, under the direction of enterprising capital, brought forth from its furnaces a production twenty per cent greater than ever before. Still better and greater, they have been the means of demonstrating to the nation that the days when the ships that float our commerce, when the mechanism which represents the highest of our inventive skill, and when the arms which protect us against our enemies, are but sources of profit to foreign hands are soon to be numbered with those for ever past.

The enterprise which has so successfully developed these resources, and the executive skill which has organized and governed the labor of this great undertaking, exhibit a power not only to emancipate the country from a foreign product, but also to free labor from the despotism of the trades unions.

CIMEX LECTULARIUS.

A correspondent, who states that he has perused with much gratification our recent article on the "Mission of the Fly," based upon Mr. Emerson's ingenious researches, sends us a pathetic epistle, in which in a few poetic, almost Miltonic, phrases he depicts dire nocturnal anguish; and then, lapsing into gross utilitarianism, he demands if we know anyuse for the bedbug. There is a vein of subtle sarcasm, we fear, underlying the request of our correspondent, or else he would not have made it; for the utility of that odoriferous insect as a stimulator to the invention of new expletives and of patent vermin eradicators is certainly unquestioned.

Still, and seriously, the writer seems to have unwittingly wandered into that same error in which nine out of ten of those whose motto is *cui bono* find themselves involved. It is an entire mistake to suppose the human race of such overweening importance in the scheme of creation that everything else is made for its benefit only. All things animate and inanimate are undoubtedly created for some wise purpose, but that such is always to enure to the advantage of man by no means follows. There have been periods in the earth's history when nothing on the globe was of the slightest human utility: man could not even exist. Again, still later, the earth, though inhabited by living beings, was unfit for humanity, for the creatures which then flourished would speedily have exterminated it. Because, then, the human race now dwells and multiplies upon the globe, there is no reason to suppose that its enemies have utterly disappeared, any more than there is to warrant a like supposition regarding things hostile to any other living creature. That the number of enemies of man is constantly decreasing is true, and that some time they may altogether disappear is not without the bounds of imagination; but it nevertheless is just as plausible to believe that the great cave bears and other gigantic brutes which peopled the earth at man's advent did not attack him a whit less fiercely than *cimex* does now. In fact, we have no doubt that some troglodyte in the recesses of his cavern, or lake dweller perched on his pile-supported lacustrine habitation, has wondered of what earthly use cave bears, and wolves, and hyenas, and gigantic saurians were, with as much fervor as any modern individual has vexed his brain with the same thought after a night's combat with the minute pests.

Clearly, then, the attempted destruction of ourselves by the bugs is only one link in the chain which pervades all animated nature, and therefore it is with equal plausibility that it may be asked: of what use are we to the bedbug? as of what use the bedbug is to us. Our correspondent who describes the effect of the ravages of *cimex* so graphically certainly will require no answer to the former question.

We know nothing good of the bedbug; he has never found, so far as we can learn, but two defenders: one, an insane Englishman who made a pet of him, and left, on dying, to his disgusted heirs, a room swarming at every point; the other, a Banian hospital at Surat, India, in which a ward was devoted entirely to vermin, as other wards were to various kinds of animals. Forbes, in his "Oriental Memoirs," says: "The overseers of the hospital frequently hired beggars from the streets, for a stipulated sum, to pass a night with the fleas, lice, and bugs, on the express condition of suffering them to enjoy their feast without molestation."

It is said that bedbugs did not appear in England until after the great fire in London in 1666, and then they arrived in the wood imported from America for rebuilding the city. It is hardly necessary for us to suggest that the bedbug, being indigenous to our soil, offers a grand opportunity for the display of another great national resource at the Centennial. Specimens of *cimicidæ*, as reared in different States, and perhaps a working model of a boarding-house bedstead, in which might be displayed the entire mode of raising the insects, would be of deep and lasting interest to foreign visitors. The fact of Pliny mentioning the bug several hundred years earlier than the time of the English writer, however, rather throws a doubt upon the assertions of the latter as to the origin of *cimex*. A variety of them certainly does infest pine woods—*ergo*, beware of pine furniture—and has been frequently found in the great forests of Sweden, and hence it is probable that in the pine lumber carried across the Atlantic whole colonies of the pest existed, which merely added to the stock already accumulated in Britain.

It is a curious fact that, in an old edition of the Scriptures known as Matthew's Bible, published in the middle of the last century, the passage translated in our modern version "thou shalt not be afraid of the terror by night" is rendered "thou shalt not nede be afraid of any bugs by night": a plausible translation in times when houses were so infested that two noblemen, after an attempt at rest in an inn, "were grievously frightened the next morning and sent for a leech, lest they were stricken with the plague."

Cimex, among other peculiar traits, hates horses and wages desperate war on fleas. He will not attack fowls, but will swallows and bats. Goeze has kept him six years without food, and he has withstood a temperature of 5° below zero, Fah., without injury. The female deposits 250 eggs at a time, which require three weeks to hatch. Against these there is practically no remedy save mercury: heat, cold, moisture, and dryness being alike destitute of effect. The insect is possessed of keen sight and of an exquisite sense of smell, by the latter of which, and not (as popularly supposed) by the sensation of heat, it is guided to its prey.

The arch enemy of the bedbug is the *reduvius personatus*, a bug which rolls itself into a ball, covers itself with dirt, and then lies motionless in wait, pouncing on the unsuspecting *cimex* the moment the latter comes within reach, and sucking its carcass dry. The objection to training and rearing the *reduvius*, as a hunter of bedbugs, is that it bites the human race with much more spite than it does its natural prey.

Finally, the use of *cimex lectularius*—if he have any, beneficial to man—is simply to preach cleanliness; for where that is maintained, he finds no resting place.

Robert Hardwicke, F.L.S.

Mr. Robert Hardwicke, founder and publisher of *Science Gossip*, a very excellent English periodical, devoted mainly to entomology, zöology, and botany, recently died of paralysis. Mr. Hardwicke is well known on both sides of the Atlantic as a zealous promoter of the cause of Science, which he has materially aided by the publication of its literature in cheap and popular form. He was an earnest advocate of the study of Nature as the greatest of all text books; and the main object of the journal, to which he devoted his best endeavors, was to inculcate like ideas among all students of Nature's works.

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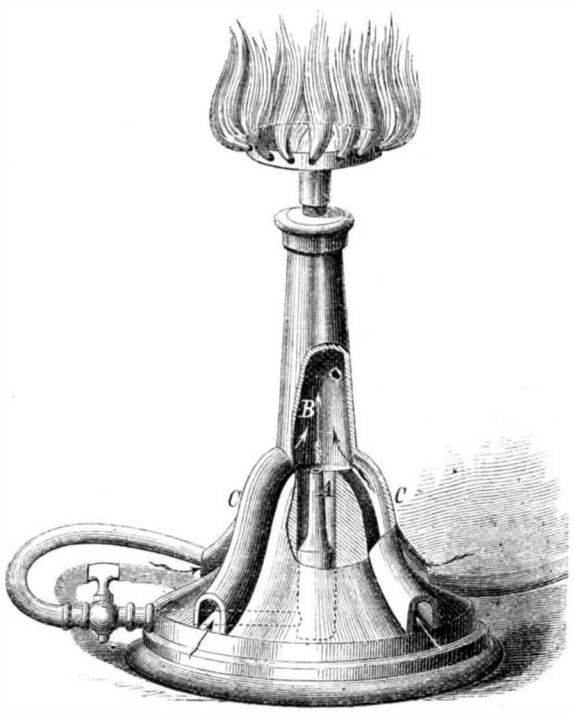
IMPROVED GAS BURNER FOR HEATING PURPOSES.

The accompanying engraving represents a new gas burner, designed for heating or cooking purposes, the novel feature in which is a chamber in the standard, in which the gas and air is mingled, the latter being drawn in by the ascending gas current. The object is to afford to the gas flame a more perfect supply of oxygen, and so to insure better combustion.

In the illustration, the gas is brought into the standard through the pipes indicated by the dotted lines and discharged at the nozzle, A, into the chamber, B. The air is drawn in through the channels, C, several of which are disposed about the lower portion of the standard and communicate with the chamber. The burner, the tube of which leads from the compartment last mentioned, is of any desired form.



Patent pending through the Scientific American Patent Agency. For further particulars address the inventor, Mr. Anatole Ehret, No. 540 Washington street, San Francisco, Cal.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW RAILWAY GAS LIGHT REGULATOR.

In the trains of the London and Northwestern Railway, in England, gas made from oil has been substituted for that obtained from coal, the former containing more carbon, weights being equal, and burning longer. Each carriage carries under its flooring its own reservoir, into which the gas is compressed to six atmospheres' pressure. From the reservoir, a copper tube leads to the regulator, which consists of a cast iron box closed by an impermeable membrane which connects by a rod with a valve. When the latter is open, the gas enters the regulator; and when the regulator is full, the membrane swells and shuts the valve. It is said that the mechanism governs the flame perfectly, keeping it equal even during the movement of the train.

THE FAUNA OF THE MEDITERRANEAN.

A series of deep sea dredgings are soon to be undertaken on the Mediterranean bottom, the results of which it is expected will add greatly to the numbers and natures of the submarine zöophytes now known. An annelid which has hitherto been believed to be peculiar to the Spitzbergen seas alone was recently discovered on the French coast.

VEGETABLE WAX.

The result of a series of investigations, recently concluded by M. de Bary, upon the subject of vegetable wax, shows that the material is a secretion of the epidermis of the plant in which it is elaborated. This is a confirmation of the theory, held by old writers but denied by more modern histologists. The wax is fusible at above 212° Fah., combustible, lighter than water and insoluble therein, but is soluble in boiling alcohol.

EARTHQUAKE INVESTIGATIONS.

Father Bertelli, an Italian monk, for several years past has made a study of the tremblings of the earth, and more especially those which are so extremely slight as not to be perceptible, save by pendulums placed in the fields of microscopes. In one year, he recognized 5,500 of the se movements; and graphically representing the same over many years by a curve, he finds that the line corresponds neither with the thermometric curve nor with the tidal phenomena, nor can it be brought into any relation with the distances or positions of the sun or moon. With the barometric curve, however, it is otherwise; and it appears that, in the large majority of cases, the intensity of the movements augmented with the lowering of the barometric column as if (as the investigator states) the gaseous masses imprisoned in the superficial layers of the earth escaped more easily when the weight of the atmosphere diminished.

A FATAL BALLOON ASCENT.

The Zenith, a balloon belonging to several eminent French aaronauts, Messrs. Tissandier, Spinelli, Sivel, and others, recently (says a cable dispatch) ascended to a hight of 26,000 feet. Two out of the three persons in the car were killed by suffocation, and the third reached the earth in a condition of eerious and probably mortal illness. No names of the victims are given; and it is to be hoped that those of none of the abovenamed eminent gentlemen have been added to the long roll of the martyrs of Science.

THE MISSISSIPPI DELTA IMPROVEMENT.

Captain Eads has, we are informed, closed a contract with Colonel James Andrews, of Allegheny City, Pa., for the construction of 350,000 cubic yards of fascine work, and 100,000 cubic yards of stone work, at South Pass, together with a large amount of timber work, piles, etc., for the Mississippi river enterprise described in our last issue. Colonel Andrews is to furnish his own outfit for this work, and put in place 60,000 yards of fascines, piles, etc., before requiring any pay. His contract will amount to $2,500,000. Colonel Andrews built the masonry work of the great bridge at St. Louis. He visited Europe last summer with Captain Eads, and carefully studied the jetty works there. He will begin providing his equipments as soon as $300,000 is subscribed by the South Pass Jetty Company, which has been organized in St. Louis. The government is to pay $5,250,000 for the work when completed and a minimum of 30 feet of water obtained.

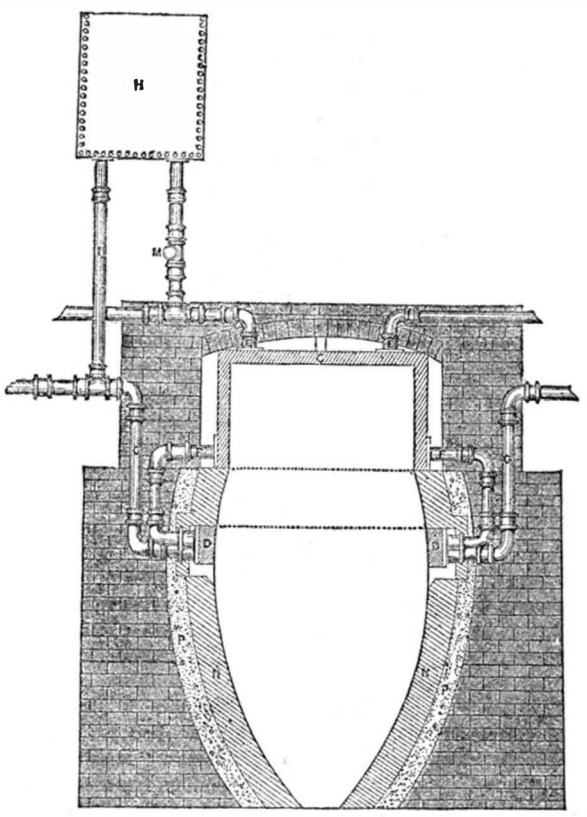
New Mode of Burial.

A new idea for the disposition of the dead has recently been broached in Paris, by a lady, Mlle. Jaloureau, which is both simple and practical, and certainly appears to offer a means of avoiding the deleterious results ascribed to the presence of cemeteries, while allowing of the retention of those, by most people, hallowed resting places. The objects sought were, first, a coffin which should closely confine all noxious exhalations, and second, a means of hastening decomposition while preventing putrid fermentation. These desiderata, it is said, are effectually obtained, the first by coating the interior of the receptacle with bitumen or asphalt, and the second, by placing with the body a quantity of phosphate of lime. The editor of *Les Mondes*, in describing this invention, asserts that corpses thus enclosed may be kept for years without alteration, save in the mummification of the bodies, and he adds that the process is virtually the same as that of the Chinese and the ancient Hebrews.

HEATING BUILDINGS WITH HOT WATER.

We illustrate, in the annexed engraving, a system of utilizing waste heat, by which water can be raised to a high temperature and conveyed to a distance, there to be used in heating buildings, etc. It is the invention of Mr. Cowan, a Scotchman, and it attracted much attention at the Manchester Exhibition in 1873. It has been largely used in Europe for hot house and greenhouse purposes.

In our engraving, the invention is shown in section, in combination with a lime kiln, but the system can be adapted to a great variety of circumstances. L is an egg shaped kiln chamber, which may be made eight or nine feet in depth; C is the main boiler, occupying the position of a cover to the kiln; D is an annular boiler, communicating with the boiler, C, through the pipes, F; G G are the return mains, completing the circulation, for the return of cooled water to the boilers, and also for keeping open communication with the expansion cistern, H; and this cistern, H, also acts as a safe-



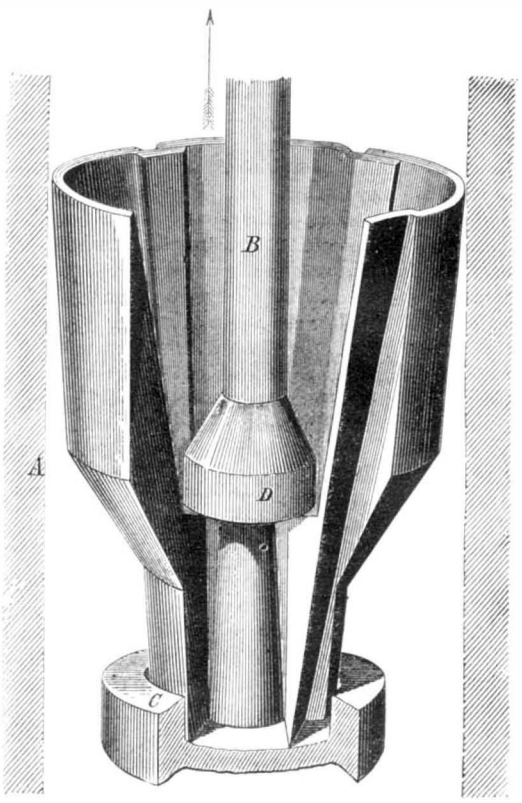
ty valve to the whole apparatus, and is therefore indispensable. The condensed water from the cistern, H, is returned to the annular boiler, D, through the perpendicular pipe, I; M is a valve in the flow pipe to the expansion cistern, H; and the pipes, E, communicate with all the premises to be warmed, and through valve, M, with compensating cistern, H. A blow-off cock for the annular boiler is necessary.

A complete circulation, through pipes of great length, is claimed for this apparatus, which can be erected anywhere outside of the buildings to be heated. In the extensive hothouses at Hatfield Park, England, 7,000 feet of four inch pipe are heated in this way; and one gentleman uses the furnace or kiln for the manufacture of coal gas for his own consumption, obtaining gas, coke, and heat for his forcing house at a very moderate expense.

IMPROVED SECTIONAL PUMP BUCKET.

The sections of which this bucket are composed are so constructed that they pack tightly together when the bucket is raised, and loosen or contract when the same is lowered. The appliance is made entirely of metal, and without pins, screws, or bolt.

A, in the annexed illustration, is the barrel of the pump



and B, the plunger rod. The bucket is formed of sections, as shown, the lower portions of which rest in the cup, C. A broad collar, D, on the plunger rod, forms the bottom of the bucket, the sections closing tightly around it, while also lapping on each other so as to break joints. The bucket is brought to an edge at the top, and when raising water it expands against the barrel and remains tight. When descending it partially collapses, and so is lowered, without friction against the barrel. The bucket may be made of any size to hold more or less water.

Patented through the Scientific American Patent Agency, March 16, 1875, to Mr. Geo. W. Burr, of East Line, N. Y., who may be addressed for further particulars.

A New Water Gas Enterprise.

We are enabled to announce to our readers that the manufacture of gas through the decomposition of steam by incandescent carbon, according to patented methods of M. Tessié du Motay, of France, is about to be carried on, on a large working scale, in this city.

The company is known as the Municipal Oxygen Gas Company, and is under the presidency of R. M. C. Graham, Esq. Their works are located in 41st. street, between Tenth and Eleventh avenues. They have decided to erect furnaces at once, and to lay mains for the manufacture and distribution of from four to five hundred thousand feet of this gas, enriched with naphtha, for illuminating purposes. The cost of the production, in this way, of a gas of good calorific power, we have every reason to believe, from information in our possession, will be very low indeed; and the prospect seems good, therefore, that gas may soon be furnished in New York city for warming houses and cooking food, as well as for many manufacturing uses, cheaply enough to inaugurate a new era of civilization—an era which we have long hoped for and looked forward to.—*American Gas Light Journal.*

John Harper.

John Harper, the elder of the two survivors of the four Harper Brothers, who founded the celebrated firm of that name, died at his residence in New York on April 22. He was born in 1796, and was the grandson of an Englishman, an early disciple of John Wesley, who came to this country about 120 years ago. With one of his brothers, he opened a small printing office in Dover street, in this city, in 1817. The two other brothers subsequently joined them; and by their joint endeavors, and their perseverance and integrity, the vast business now owned by the firm was steadily and quickly built up. Mr. Fletcher Harper is now the sole survivor of the original firm; but the sons of the seniors are accomplished business men, and there is no fear but that the house will be carried on in a manner to sustain its reputation.

A BELLIGERENT PROFESSOR.—Señor Varela, Professor of Physiology in the Medical School at Barcelona, Spain, was recently annoyed by hissing and other disturbances among the students, whereupon he drew a loaded revolver and threatened to fire on the class. A general stampede took place, in the midst of which the rector seized and disarmed the warlike teacher, and conducted him off the scene.—*Medical Journal.*

ACCORDING to the *Journal des Chemins de Fer* of Constantinople, the total length of all the railroad lines in the world is 122,462 miles, and their cost, $11,255,100,000.

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THE NEW GOLD FIELDS.

No expedition since the war, says the *Science Record* for 1875, has attracted more attention or excited more interest than the one which left Fort Abraham Lincoln, Dakota, on the 2d of July, 1874, to explore the Black Hills. This region of country, lying in the southwestern part of Dakota, and extending some distance into Wyoming, and slightly indenting Montana, has, until now, in its interior, been entirely unexplored by the white man. Previous expeditions have skirted the hills, but never penetrated them, and we have been dependent on the reports and traditions of the Indians for the little we have known of them. The hostility of the Indians has defeated any attempts to explore the country by civilian parties.

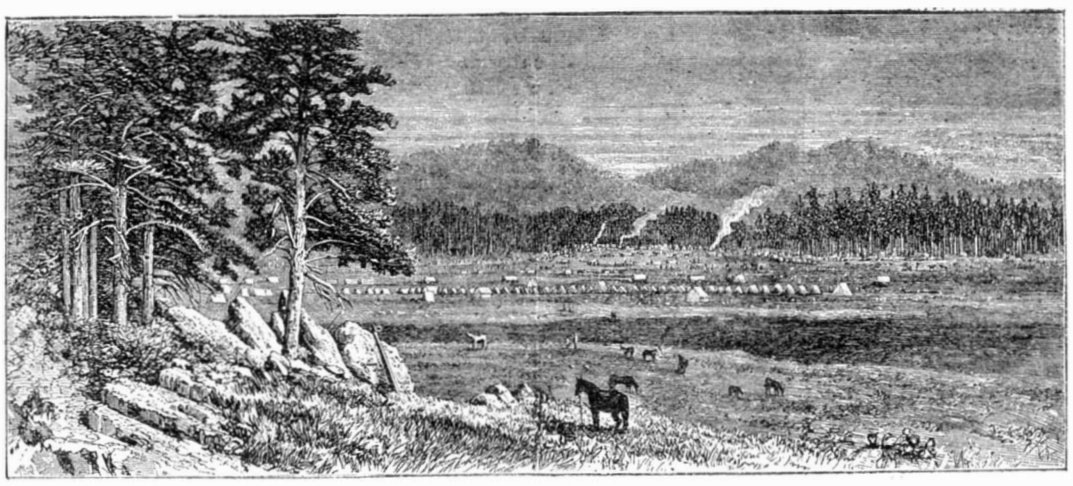
The present expedition was entirely a military one, and consisted of ten companies of the 7th cavalry, two companies of infantry, and three pieces of artillery, in all about 700 soldiers, with the addition of a train of 120 wagons, and about as many teamsters, the whole under command of Major General George A. Custer. The scientific corps consisted of Colonel William Ludlow, U.S. Engineer Corps; W. H. Wood, assistant; Professor N. H. Winchell, geologist; Professor N. H. Winchell, geologist; Professor A. B. Donaldson, assistant; George B. Grinnell, palæontologist; L. H. North, assistant; Dr. J. W. Williams, chief medical officer, botanist.

The expedition reached the Black Hills about the 20th of July, after a march of eighteen days, mostly over an arid, treeless, desert country. General Custer, in spite of the prophecies of his Indian guides, who declared the thing impossible, succeeded in penetrating to the very interior of the hills with his wagon train; and by sending off detachments of cavalry here and there, has succeeded in exploring and mapping the hills through their entire length and breadth. The country is found to be of great scenic beauty, as shown by our illustration, and is luxuriant in vegetation, abundant in game, timber, and good water. Thousands of acres of fertile land invite settlement. The country, however, is a part of the Sioux reservation, and cannot be opened to the whites until the government shall make some satisfactory arrangement with the Indians.

On the 31st of July gold was discovered along the banks of a creek, on which the expedition was encamped, the best pans yielding from five to ten cents' worth of gold, equivalent to fifty dollars a day to the man, if the yield should prove as good as promised.

Our camp view of the principal park in the hills gives some idea of the size of the expedition. This site was selected for the permanent camp, and from this point detachments radiated for several days.

Many expeditions to this region have been organized, and numerous persons have been induced to deposit small sums of money for outfit, fees, preliminary expenses, etc. It should, however, be known that the military authorities will maintain the rights of the Sioux Indians, and will prevent any attempt, on the part of white men, to commence mining operations within their territory. The specious advertisements for miners and adventurers to start immediately to the Black Hills gold fields should therefore be avoided.



THE NEW GOLD REGIONS.—BLACK HILLS.

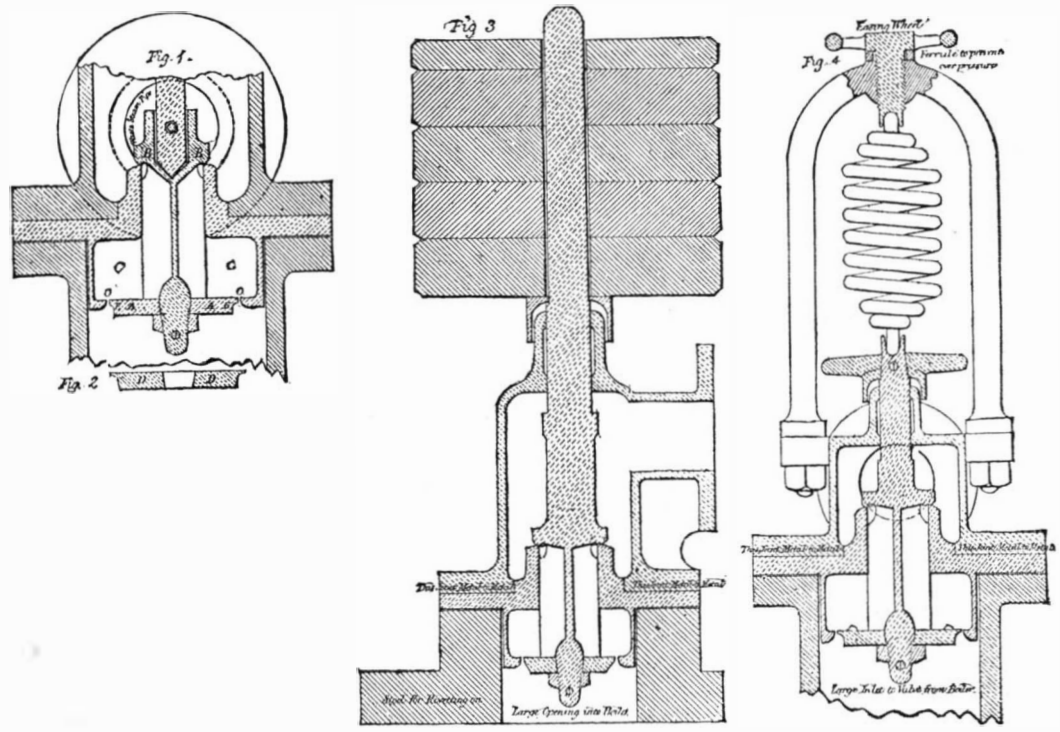
IMPROVED SAFETY VALVE.

Our engraving shows a new form of safety valve for marine use, from which the steam is led away and blown into the sea without any increase of pressure being necessary. It is the invention of Messrs. D. Cockburn & Son, of Port Eglinton, near Glasgow, Scotland, and three forms of it are shown in the illustration (for which we are indebted to *Engineering*); but a description of Figs. 1 and 2 will serve to explain the whole. This valve, which is $1\frac{5}{16}$ inches in diameter, was applied to the boiler of the steam yacht Griffin, this boiler being worked at 60 lbs. pressure, and having three furnaces containing 50 square feet of fire grate area. The steam escaping through the valve was not discharged freely into the atmosphere, but was led down through a pipe and discharged through the vessel's side below the water line.

Notwithstanding this arrangement of the discharge, and the large fire grate area, this valve was found capable of preventing any accumulation of steam pressure beyond that to which it was loaded. The manner in which this result is obtained is as follows: Referring to Fig. 1, it will be seen that the safety valve proper, B B, is an ordinary valve with feather guides and bearing upon a narrow flat seat. Below the flange carrying the seat of the valve is formed a chamber, C, and the feathers of the valve are prolonged downwards so as to carry a disk, A A, which nearly fits an opening formed in the bottom of the chamber, C. The result of this arrangement is that, on its way to escape through the valve when the latter is lifted, the steam has to pass through the narrow annular space, O O and in doing so, it becomes wire-drawn, causing the pressure in the chamber, C, to be less than the boiler pressure. The upper side of the disk, A, is thus, as soon as the valve opens, exposed to a less pressure than the lower side, and thus the valve, as it lifts, is assisted in opening by the excess of pressure on the under side of the disk, A.

The disk, A, has a thickness equal to the lift of the valve, and its periphery is turned to such a form as to increase the annular area, O O, as the valve rises, the ratio of this increase varying according to the way the valve is loaded. In the case of the valve fitted to the Griffin, the bottom disk was originally made as shown at D, Fig. 2; but this form, although suitable for a spring-loaded valve discharging into the atmosphere, was found not to give sufficient lifting power to overcome the resistance of the water in the case of the discharge below the water line. In this latter case it was found that, when the valve commenced to rise, a good deal of power was required to set in motion the water in the pipe, and hence a disk was applied having the edge formed as shown at E E, Fig. 1. This form was found to answer perfectly, as we have already stated. While speaking of this silent discharge, we may mention also that it was found necessary to fit to the pipe an air valve opening inwards to prevent the waste steam pipe, etc., from being filled with water when the blowing-off of the steam ceased.

Of the remaining figures, Fig. 3 shows one of these valves loaded with dead weight, and in this case it will be seen a different form of relieving disk is employed; while Fig. 4 shows a spring-loaded valve. Of course other modifications can be arranged to suit various circumstances. Altogether the valve is a very simple one, and it appears in the recent trials to have shown an efficiency which entitles it to special attention.



COCKBURN'S EQUILIBRIUM SAFETY VALVE.

BRITISH iron rails have ceased for the time to be an article of American consumption. About $6,500,000 worth of British rails were imported in 1874, but they were all, or nearly all, steel. The change is very great and sudden, for in 1872 our imports of British rails amounted to $24,000,000, and in 1873, to $12,000,000. Notwithstanding the great fall in iron since 1872, the decrease in quantities is no greater than that in values, which is owing to the fact that last year we imported only steel rails, which will last a great many years, while in 1872 we imported the cheapest and poorest iron to be found in England.

Sleep, and How to Procure It.

We read of Bismarck that "his old foe *insomnia* still tenaciously clings to him. He passes whole nights waking. At morning dawn, slumber, if not sleep, comes at last, but the day finds him weary and unfit for work, yet with mountains of work to get through." Having paid considerable attention to this important question of being able to procure sleep, I venture to record what I know about it.

The human frame cannot do without sleep. I believe the reason is that the mysterious property—for want of a better name we call it "vital energy"—gradually leaks out during the day. During sleep, the machinery of the body, especially the brain, becomes recharged with it. The cause of not being able to sleep—I write now of people in good health and hard workers with their brains—is that the brain cannot, so to speak, "go down," but it continues to act, more or less. My father, when writing the Bridgwater Treatise, had his own way of working. He was an excessively busy man during the day, and had only the night hours in which he could write. He generally dined at seven o'clock, and immediately after dinner went to sleep for two or three hours. He then got up, and worked on till two or three in the morning. Just before retiring to rest, he took some light pudding, or a sandwich, with cocoa or milk. Thus he always slept well, as the blood was diverted from the brain to the stomach.

I have no hesitation in saying that the proper thing to do is to go to sleep immediately (or at least very soon) after the meal of the day. All animals always go to sleep, if they are not disturbed, after eating. This is especially noticeable in dogs; and the great John Hunter showed by an experiment that digestion went on during sleep more than when the animal was awake and going about. This is his experiment: He took two dogs and gave them both the same quantity of food. One of them was then allowed to go to sleep, the other was taken out hunting. At the end of three or four hours he killed both these dogs. The food in the stomach of the dog which had been asleep was quite digested; in that of the one which had been hunting the food was not digested at all.

This fact, I think, shows the advisability of going to sleep immediately after eating. This ignored fact always occurs to my memory when I see old gentlemen nodding over their wine. Nature says to them: "Go to bed." They will not go to bed, but still Nature will not allow her law to be broken, so she sends them to sleep sitting in the chairs. People therefore who feel sleepy after dinner ought to dine late, and go straight to bed when a sleepy feeling comes over them.

Most good folks, however, do the worst possible thing imaginable; they retire altogether into the drawing room, and then to make matters worse, they drink tea and coffee. Now I regard tea and coffee when taken at night to be poison to certain constitutions. It is very well in the morning, but it is very bad at night. The reason why tea and coffee should not be taken at night is that the one contains an alkaloid called theine, and the other contains an alkaloid called caffeine. These two alkaloids taken into the system stimulate the brain and do not allow it to go to rest. I speak of this matter from experience. If I take thoughtlessly a cup of of tea or coffee after five o'clock in the evening, going to bed about eleven, I cannot go to sleep; and if the brain does fall asleep, the alkaloid will wake it up in about an hour or two. Sleeplessness, therefore, is usually caused by tea or coffee, though strange to say that tea and coffee actually send some people into sound slumber.

I well recollect the late Dr. Wilberforce, then Bishop of Oxford, telling my father, then most actively engaged as Dean of Westminster, of his patent way of going to sleep. It is better than the oldfashioned prescription of watching sheep jumping through a hedge one after another, ships sailing out to sea, etc. The Bishop's prescription was to repeat very slowly the vowels A E I O. In doing this, they were to be faintly pronounced with each inspiration and expiration. It will be found easy to do this without moving the lips, but the vowel U must not be pronounced, for to do this the muscular action of the lips necessarily takes place, and sleep comes not. I advise my readers to try this plan.

I once heard of a midshipman who complained that he could not sleep at night because there were no waves dashing against the sides of the ship. To this noise he had so many months been accustomed that he could not sleep without the familiar sound. He asked his mother to dash pails o;

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water against his bedroom door till he went to sleep. I was once told, when on a salmon inspection, that a certain miller could sleep so long as the continued whirr of the mill wheel was going on, but directly the noise stopped he awoke.

The deepest sleep is always just before dawn. It is, I believe, probable that some change takes place at this time in the atmospheric condition, as the hour just before dawn is selected by savages to make their attack, and it is at this time also, I believe, that a great proportion of children are born. When staying at a country house, unfortunately, the visitor not accustomed to country sounds gets often woke up. The abominable cocks begin their horrible crowing, called, in Herefordshire, "cock shoot." I recollect on one occasion, after the wretched cocks had gone from the fowl house to feed, I fell asleep, and then there came a most awful cry of agony; in fact, the farmer killed a pig under my window—enough to wake anybody. This pig was most vociferous, but as he was immolated in honor of my arrival, I could not say much.

My monkeys always get sleepy when the gas is lighted in my study, where I and my monkeys always sit. This room was once called by the servants the "Master's room"; but I found out lately, by accident, that they now call it the "Monkey's room." This is Darwin going backwards!

Dogs, likewise, will sleep at night if they can; cats, I observe, are sleepy in the morning, the reason being that the wretches have been out all night, and, of course, feel very seedy in the morning, and doubtless their heads ache sometimes; and it serves them right if they did, considering the row they make, fighting and caterwauling! I have strong reasons to think that my own black cat is president of a free and easy club, for they hold their meetings among the ruins of the Colosseum at the back of my house. This a regular "cattery." All the stray cats in the Regent's Park and the neighborhood come here to arrange family matters; sometimes they come into a back cellar where I keep skeletons, casts, etc., and kindly supply me with a fine lot of kittens, which I convert into skeletons, casts, etc. I confess I do not know how to get rid of caterwauling cats. Will any one tell us?

I now venture to suggest a new but simple remedy for want of sleep. Opiates in any form, even the *liquor opii sedat.*, and chlorodyne, will leave traces of their influence the next morning. I therefore prescribe for myself—and have frequently done so for others—onions: simply common onions raw, but Spanish onions stewed will do. Everybody knows the taste of onions; this is due to a peculiar essential oil contained in this most valuable and healthy root. This oil has, I am sure, highly soporific powers. In my own case they never fail. If I am much pressed with work, and feel I shall not sleep, I eat two or three small onions, and the effect is magical. Onions are also excellent things to eat when much exposed to intense cold. Mr. Parnaby, Troutdale Fishery, Keswick, informs me that, when collecting salmon and trout eggs in the winter, he finds that common raw onions enable him and his men to bear the ice and cold of the semi-frozen water much better than spirits, beer, etc., The arctic expedition, just now about to start, should therefore take a good stock of onions. Finally, if a person cannot sleep, it is because the blood is in his brain, not in his stomach; the remedy, therefore, is obvious: call the blood down from the brain to the stomach. This is to be done by eating a biscuit, a hard boiled egg, a bit of bread and cheese, or something. Follow this up with a glass of wine or milk, or even water, and you will fall asleep, and will, I trust, bless the name of—*Frank Buckland, in Land and Water.*

ANILINE colors can be used to impart to paraffin candles most beautiful red, purple, and violet tints.

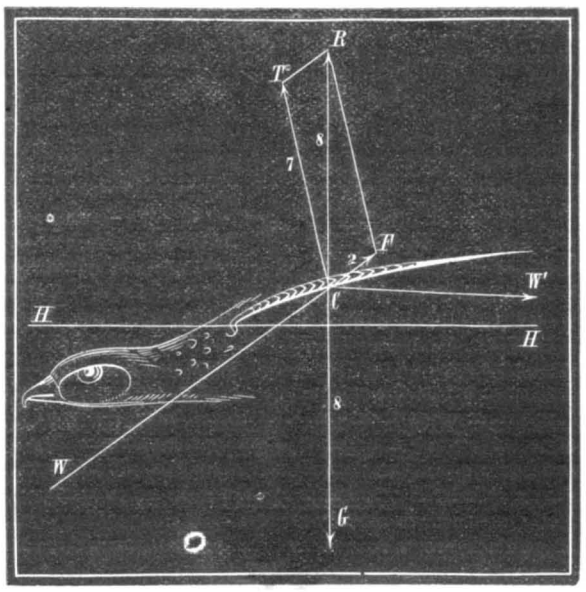
Correspondence.

The Flight of Birds.

To the Editor of the Scientific American:

The ability (possessed by some birds) of hovering or remaining fixed over a given point during the prevalence of a breeze, and that, too, without any apparent motion or exertion, has ever been a fruitful theme for speculation. Some regard it as a phenomenon beyond the penetration of the human mind, while others refer it to the positive and negative forces of electricity, to the fact that the bones of the bird are hollow, or to some other cause. The most recent publication pertaining to this subject is an elaborate work by J. B. Pettigrew, M. D., who has long been regarded as an authority in the old world. Though one hundred pages are devoted to "progression through the air," I think only one reference is made to the subject of hovering. On page 115, he informs us that the hawk, when hovering, sustains his body "by the action of his wings." But the *modus operandi* and mechanical principles involved are not explained. Neither is it possible to deduce them from the results of any of his experiments. It is to be regretted that the learned gentleman was not a little more explicit on a point that is quite as remarkable as anything relating to the subject of which he treats.

I submit a solution on simple mechanical principles, which illustrates not only how a bird may remain fixed in a current of air, but explains other equally well known facts, namely, how it can rise or fall in a vertical line, or move ahead or back, to the right or left, in a horizontal line, and that, too, without the expenditure of muscular force other than may be necessary to keep its body poised in a proper position. It is based on the fact that the course of the wind over the surface of the earth is not always horizontal, but sometimes inclined upward. That becomes evident when we reflect that winds are caused, primarily, by unusual heat in the air in a given locality, causing it to rise, and giving the surrounding air a tendency to rush in to fill up the space, the same cause imparting both an onward and an upward movement. This may be illustrated on a small scale by a burning gas jet, which heats the air, causing it to rise. If the air in the room be permeated with smoke, or any substance by which its motion can be discerned, it can be seen that, as the air rushes in to feed the flame, the smoke moves with an upward inclination. If this be not true of winds (under some circumstances at least), how is it possible to account for sand being carried by wind into a second story window, or the cinders of a volcano 1,000 miles out to sea, or a stick of timber, one foot square and twenty feet long, being raised from the ground and carried a long distance through the air during the passage of a tornado? These results could not be produced by horizontal air currents. With this understood, we have but to apply the law relating to the parallelogram of forces in order to comprehend the annexed sketch, illustrating various mysterious movements in the flight of birds. H H' represents a horizontal line, C G a vertical line, and C the centers of gravity and of resistance, which coincide. W C represents the direction in which the wind is blowing, and C W', the direction in which it is reflected from the under surface of the bird's wing. The resulting pressure or thrust of the wing will be at right angles to its surface, or in the direction of the line, C T.



Another force is brought to bear on the bird. It is the force of the wind against its body, and is exerted in the direction of the line, C F. This force we will suppose to be to the thrust of the wings as 2 to 7; yet it is not essential just what the ratio is. The resultant of these two forces, C F and C T, will be exerted in the direction of the line, C R. If the wind be blowing so as to produce a force of 2 ozs. in the direction of the line, C F, the line, C T, will represent a force of 7 ozs., and the line, C R, 8 ozs., that being the comparative length of the lines forming the parallelogram, C F R T. This resultant force, C R, being exerted in a vertical direction, and the weight of the bird being 8 ozs., there will be an equilibrium between the two forces, and the bird will remain suspended as in hovering.

Should the wings of the bird be expanded so as to present more surface, or should the wind increase in force, then the resultant force will be greater than 8 ozs., and the bird will move upward in a vertical line; but if the wings are contracted so that the force of the wind on them is diminished, and the resultant force is less than 8 ozs., then the bird will descend in the same vertical line.

Should the angle which the wings make with a horizontal line be increased, the direction of the resultant force, C R, will not coincide with a vertical line, but will incline forward of it, and the bird will move forward in a horizontal line. The movement will then correspond to that of a close-hauled vessel sailing near the eye of the wind, the weight of the bird serving as a fulcrum, and corresponding to the keel or centerboard of the vessel.

If the angle of the wings be diminished so that the direction of the resultant force inclines aft of a vertical line, the bird will move backward in a vertical line, provided that the magnitude of the resultant force be 8 ozs.

If the body and wings of the bird be careened to the right, so that the direction of the resultant force inclines to the right of a vertical line, the bird will move to the right in a horizontal line; but if the bird be careened to the left, then the motion will be reversed. It will be seen from the above that the movement is dependent on two conditions, namely, the ability of the bird to control the amount of the resultant force by increasing or diminishing the expanse of its wings, enabling it to rise and fall in a vertical line, and, secondly, its ability to control the direction of the resultant force by altering the inclination of its wings, whereby it is enabled to move to any point of the compass in a horizontal line. By a proper combination of those conditions, an infinite variety of evolutions and manœuvers can be performed, but an explanation of these is more complicated.

The sketch is not intended to be in proportion or to represent positions accurately, but only the general application of principles.

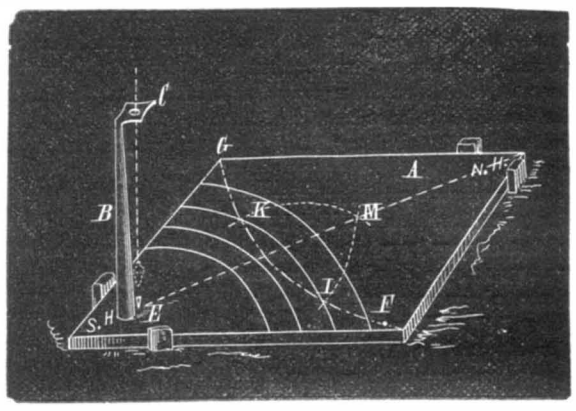
F. G. FOWLER.

Bridgeport, Conn.

Finding the Meridian.

To the Editor of the Scientific American:

I have used for the above named purpose, while surveying the experimental line for the original Pacific Railroad thirty years ago, a simple expedient, of which I send you a sketch. A is a board about two feet square, placed level on the ground and secured by pegs; near the southerly corner a



staff, B, is raised perpendicularly. On the top of B is placed in a slit a piece of tin, C, having a small hole in it; this tin is placed nearly at right angles with the rays of the sun at noon. A plumb line is passed through the hole in the tin, and the point, E, is marked. From this as a center, a number of concentric lines are marked on the board. Towards noon, the sun's rays, passing through the hole in the tin, C, will pass over the board from F to G, as shown by the dotted line. If, before noon, the point be marked where the shadow crosses one of the concentric lines, say at I, and again where it passes the same line after noon, at K, and if a perpendicular be raised from the points, K and I, at M, then a line drawn from E through M gives the correct meridian.

Thus any person can lay out the true meridian; and the variation of the compass from the true north can be ascertained with the greatest nicety, a point of the highest importance to surveyors, as the variation of the needle is, in most places in our western States, an uncertain quantity.

JOSEPH A. MILLER.

[For the Scientific American.]

THE PALMS OF THE AMAZONS.

BY PROFESSOR JAMES ORTON.

Palms, bananas, and ferns are the three forms of special beauty peculiar to a tropical forest. Of these, the first give the most striking, as well as the most graceful, feature to the landscape. The elegance of the tall, slender stem, rough with the scars of fallen leaves, but branchless and symmetrical as a column, and the luxuriance of the feathery or fan-like foliage tossed out of the summit, compel admiration which no amount of familiarity tends to diminish.

It is usually supposed that the palms tower over all the other trees, their crowns standing so far above the surrounding vegetation as to give Humboldt's idea of "a forest above a forest." Along the sea coast and river banks, this is true; but within the virgin forest, the loftiest palms rarely exceed the average hight of the exogenous trees. The highest may measure 130 feet, while the Brazil nut tree stands 200 feet.

Palms have a wonderful development of the organs of fructification, a single individual bearing half a million of flowers. Yet the number of trees representing a species is not in proportion. This is mainly due to the fact that the fruit is frequently aborted, or forms the food of hosts of animals, insects, birds, and mammals. Even man depends upon the palms for many important products—wood and leaves for habitations, bark and leaves for cloth and cordage, buds and fruit for food. The Indians call the miritĺ the "tree of life."

At the beginning of this century, only twenty-three species of palms were known to the scientific world. Now, mainly through the labors of Humboldt and Bonpland, Spix and Martins, Poeppig, Wallace, Spruce, Wendland, and Griesbach, in the new world, and of Blume and Griffith in the old, we distinguish nearly 600 species. These belt the earth between the latitudes of New Zealand and South Carolina. Humboldt was right in calling South America the most beautiful portion of the palm world. Certainly it yields to no continent in exuberance and variety. Europe has but one species, and Africa comparatively few; India is the only rival. There are 273 American forms, and probably 75 of these are peculiar to the Amazonas.

Palms have small power of migration: and it does not appear that any species is able to cross the ocean without the aid of man. They are distributed between the sea shore and the altitude of 11,000 feet. A few species range from the roots of the Andes across the whole plain to the Atlantic; but many are restricted to certain tributaries—to the Lower Amazons, the Solimoens, or the Marañon. Palms are far more abundant on the east than on the west side of the Andes, and the species are entirely distinct.

The following are the most important palms observed in ascending the Amazons and its chief affluents. The first two are fan-leaved; all the rest have feathery leaves.

Miritĺ, so called in Brazil, the Achuál of Peruvians, the *Mauritia flexuosa* of science, is the most universally distributed palm in the valley, abounding from the shores of the Atlantic to the altitude of 3,000 feet on the Andes of Peru, Ecuador, and New Granada. It is distinguished from all others by having both fan-shaped leaves and scaly fruits. It is a social palm, forming groves along the low shores at the mouths of tributaries and about swampy lakes. It is always

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a conspicuous object, the smooth stem often rising one hundred feet, and bearing enormous spreading leaves and clusters of egg-shaped, reddish fruit, resembling pine cones. The epidermis of the leaves furnishes a useful fiber, the orange pulp of the fruit is eaten by the Indians or made into wine, and the farinaceous pith yields a kind of sago.

Bombonáje, or *Carludovica palmata*, the young, unexpanded leaves of which are so largely used at Moyobamba and Guayaquil in the manufacture of Panama hats, is called a palm, but is more properly a screw pine. It has no stem; the leaves are long, slender petioles, springing from the ground. The leaves are about two feet long, fan-shaped and four-parted, each segment being again ten-cleft; so that when folded in venation, each segment on its own rib, there are eighty layers in a young leaf. It occurs only on the slopes of the Andes. (See engraving on this page.)

Assaí, or *Euterpe oleracea*, is very common, and is the first palm, after the miritĺ, which arrests the attention of the traveler. Its tall, straight, slender stem, rising from 75 to 100 feet, its curious cabbage top (a long cylindrical leaf sheath), and its arched, plume-like foliage, eight or nine feet long, trembling in the gentlest breeze, give a peculiarly picturesque feature to the views on the Lower Amazons. Its leaves consist of 78 pairs of leaflets. The tree grows on moist soils from Pará to Teffé.

Paxiúba of Brazilians, the huacra-pona of Peruvians, and the *iriartea exorrhiza* of botanists, is equally abundant at the mouth of the great river and in the moist valleys of the Andes. It is easily recognized by its buttressed stem, that is, supported on a cone of emersed prickly roots resembling the spoken of a half opened umbrella, so that the tree looks as if standing on stilts. It is about forty feet high. (See engraving on page 354, vol. XXIX.)

Barrigúda, called tarapóto in Peru, is the *ireartea ventricosa*. It is distinguished from all other palms by a curious swelling midway up its trunk. It is a solitary palm, rising from 60 to 100 feet. It is also buttressed, the cone of roots sometimes standing twelve feet high. The leaves, usually six in number, are eighteen feet long. It grows on lands not inundated, and ranges from the Rio Negro to 5,000 feet on the Andes.

Piassába is a species of *Leopoldinia*, which furnishes the valuable piassába of commerce, exported to England for the manufacture of brooms and brushes, but used on the Amazons for cables, for which it is admirably fitted, being durable and light, not sinking in water. The fiber in young plants is nearly five feet long, in old trees not two. The tree is about thirty feet high, and bears thick, large leaves fifteen feet long, with sixty pairs of leaflets. The stem is stout, and covered with a pendulous, brown, hairy beard, which is the fiber used. It is found only far up the Rio Negro.

Bussú, or *manicaria saccifera*, common about the mouth of the Amazons, looks at a distance like a rigid plantain, bearing immense, stiff, simple leaves, of a pale green color, and twenty-five feet long by six feet wide. The stem is not over twelve feet high.

Baccába, or *œnocarpus distichus*, is a stately, elegant tree, sixty feet high, with a straight, smooth stem, and a flattened crown of a dark green color. The leaflets are numerously and strongly plicate. The large bunches of oily fruit, weighing thirty pounds, are used, like those of the assaí, in making a beverage. The baccába grows on the Brazilian Amazons. Another species, called pataná, is a giant among the palms, standing from 80 to 100 feet, with leaves nearly half that length. The veins of the leaves furnish the Indians with the needle arrows for their blow guns.

Jupatí, or *raphia tædigera*, is famous for its long, shaggy leaves. which measure from forty to fifty feet. It is the only fruited palm in America that has pinnate leaves. It belongs to the lower part of the Amazons.

Pupúnha, or peach palm, *bactris gosipaés*, is one of the most beautiful and useful of palms, growing generally in clusters from sixty to ninety feet high, and thickly armed with prickles. Its numerous, curling, drooping leaves, seven feet long, have from sixty to seventy pairs of leaflets pointing in all directions. Under the deep green vault hangs the huge cluster of fruit, yellow and red when ripe, about seventy-five in number, and making a load for a strong man. It is nowhere found wild, although an undoubted native, but is seen in cultivated spots along the whole river. The Peruvians call it pisho-guayo. Many other species of *bactris* occur, but they are all dwarf palms, and form a considerable portion of the undergrowth in recent forests.

Tucúm of Brazilians, cambíra of Peruvians, is the *astrocaryum vulgare*, a common forest palm, with a stout trunk from fifty to sixty feet high. The closely set leaves stand erect, broom-like, at the head of the stem. From the cuticle of the fronds are made the strongest mats, hammocks, nets, and twine on the Amazons.

Jauarí, belonging to the same genus as the last, is one of the commonest palms along the banks of the Middle and Upper Amazons, and the clustered, rather slender, but very prickly stems, about thirty feet high, contribute to give a forbidding and monotonous aspect to the low, inundated, sandy shores. It bears an excessively hard nut.

Murumuru, another *astrocaryum*, abounds particularly along the banks of the Marañon. It rarely exceeds fifteen feet in hight, but it carries a graceful head of long, pinnate leaves, and formidable spines. A spiny relative, on the Lower Amazons, is significantly called munbáca, or "wake up!"

Inajá, or *Maximiliana regia*, is a fine feathery palm, quite common in the primitive forests along the whole river, but most conspicuous up the Rio Negro, where it is called cocurito. Its large spathe is used as a readymade basket. The stem is of moderate hight, and the leaves, in circles of fives, spread slightly, forming an open vase.

Yágua, the *attaba Humboldtiana*, upon which the great German traveler said Nature had lavished every beauty of form. The smooth, ringed, slender stem rises from twenty to forty feet high, and its leaves, about six in number and over thirty feet long, spring almost vertically into the air, but arch over at the ends. The pinnæ are arranged vertically, not horizontally as in other palms, and number some two hundred pairs in a single leaf.

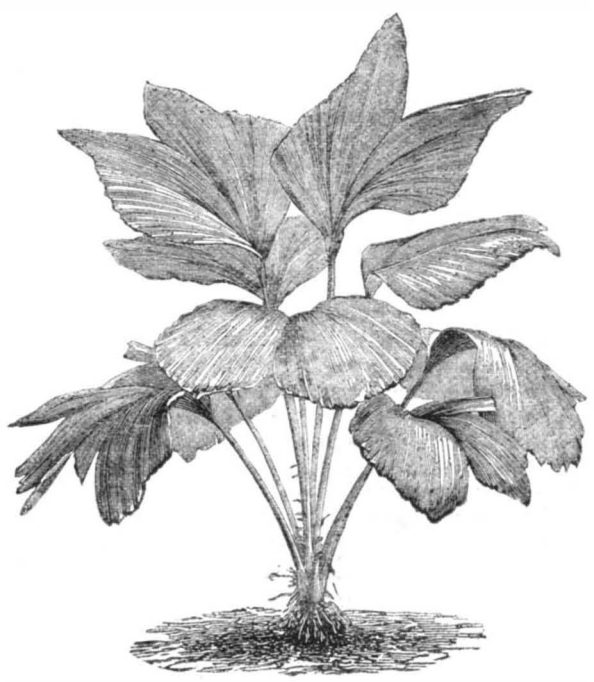
Urucurí, or *attaba excelsa*, common to the Brazilian Amazon, has a smooth, columnar stem, nearly fifty feet high, and broad leaves with symmetrical, rigid leaflets. The fruit is burnt for smoking rubber. Another species, the stemless curuá, grows on the Tapajos and Negro, and its fruit contains milk.

Cocoanut, the well known *cocos nucifera*, is limited to the Atlantic end of the Amazons, and must be cultivated. As far inland as Manáos it grows, but will not fruit.

Ivory palm. There are two species of this so-called palm, the *phytelephas macrocarpa*, or polo-ponto, and the smaller *p. microcarpa*, or yarína, both growing along the east side of the Andes; and both are different from the Guayaquil species, which has a high trunk. The seeds yield the vegetable ivory of commerce.

THE SCREW PINE OF THE AMAZONS.

Our engraving exhibits a characteristic specimen of the tropical vegetation of South America. Palm-like as the foliage is, the plant is one of the screw pines, contained in



STEMLESS SCREW PINE (*Carludovica humilis*).

the order *pandanaceæ*. The specimen, being of dwarf growth, is altogether different from the climbing varieties, to which its obvious aerial roots would indicate its close relationship. The leaves are of a fine dark green; and the flowers, which are inconspicuous, are of the monœcious tribe, having the stamens and pistils on separate flowers on the same plant

Toughened Glass.

About seven years since, M. Francois de la Bastie, a French engineer, after long and patient investigation into the subject, discovered a simple means of rendering glass practically unbrittle, and at the same time of preserving its transparency. Broadly stated, it consists in heating the glass at a certain temperature and plunging it while hot into a bath consisting of a heated oleaginous compound. There are, however, many conditions in connection with the details of the process upon which a satisfactory result depends, and the neglect of any, even in a slight degree, constitutes the difference between success and failure. Thus, the glass may be underheated and will not be susceptible to the effect of the bath, or it may be overheated and it will then lose its shape, or, again, it may be rightly heated and yet be spoilt in the course of transference to the bath. Moreover, the oleaginous constituents of the bath and their temperature have an important bearing upon the ultimate result. These and numerous other points of detail have all been satisfactorily settled by M. de la Bastie, who has designed furnaces and baths by means of which his toughening process can be carried out practically without fear of mischance. The time occupied in the actual process of tempering is merely nominal, for directly the articles are brought to the required temperature they are plunged into the bath and instantly withdrawn. The cost of tempering, too, is stated to be very small.

The physical properties of the material become altered in a very remarkable manner. To this singular fact we can testify, from the inspection of a number of toughened glass articles at the offices of Messrs. Abel Rey and Brothers, 29 Mincing lane, the representatives of M. de la Bastie in England. In these articles, which consisted of watch glasses. plates, dishes, and sheet glass, both colored and plain, neither transparency nor color is affected at all, and the ring or sound only slightly. These articles, some of them being exceedingly thin—were thrown indiscriminately across a room against a wall and fell spinning on the deal floor. Water was boiled in a saucer over a fire and the saucer was quickly removed to a comparatively cold place, and was unaffected by the sudden change of temperature. One corner of a piece of glass was held by the hand in a gas flame until the corner became exceedingly hot, but the heat was not communicated to the other portion of the glass, neither was it cracked from unequal expansion. A comparative experiment was then made with a piece of ordinary plate glass and a similar piece of toughened glass, in order to show their respective powers of resistance to fracture from the force of impact by a falling weight. In each case the glass was about 6 inches square, and was placed in a frame, the weight being dropped upon its center. With the ordinary glass, a 2 ounce brass weight, falling on it from a hight of 12 inches and 18 inches respectively, did no damage, but at 24 inches the glass was broken into several fragments. With a thinner piece of toughened glass, no impression was made by the same weight falling from hights ranging from 2 feet to 10 feet, the weight simply rebounding from off the glass. An 8 ounce iron weight, tried at 2 feet and 4 feet respectively, gave similar results. Upon the hight being increased to 6 feet, however, the glass broke. But here another singular result was produced; instead of breaking into about a dozen pieces, as did the ordinary glass, it was literally smashed to atoms. The largest fragments measured half an inch in length and breadth, and these were easily reduced by the fingers to atoms varying in size from that of a pin's point to that of a large pin's head. The lines of fractures in the fragments presented to the eye the appearance of irregular lace work, and these lines were, moreover apparent to the touch, but more palpably so on one side of the glass than the other. Which of the two sides was the one that received the first impact of the blow, we were not able to determine. Another peculiarity is that the edges of the fractures are by no means so sharp, and therefore capable of causing incised wounds, as are those of ordinary glass. It would seem that the toughened glass possesses enormous cohesive power; but that if the equilibrium of the mass is disturbed at any one point, the disturbance or disintegration instantly extends throughout the whole piece, the atoms no longer possessing the power of cohesion.

Of the practical nature of M. de la Bastie's unique discovery, there can be no question whatever, nor can there be any doubt of its value in the arts, sciences, and manufactures. The applications which suggest themselves are innumerable; and above and beyond the usefulness of the process with regard to articles of domestic use, come important considerations affecting the applied sciences, especially in connection with chemical manufactures and similar industries, where a material, alike uninfluenced by the action of heat or acids, has been so long and so vainly sought for—notably in connection with vitriol chambers in the manufacture of sulphuric acid, and for piping in chemical works. For the present there remains one purpose to which toughened glass cannot be so easily applied, and that is to window glazing in odd sizes, inasmuch as it cannot be cut by a diamond or other ordinary means. Our glaziers will therefore have a respite, but we cannot give them much hope that it will prove a long one, as experiments of considerable promise are being conducted with the view of solving this problem. Moreover, the glass can be cut to the proper sizes before toughening if desirable. The glass, however, is readily engraved, either by fluoric acid in the usual way, or by Mr. Tilghman's elegant sand blast process. It can be easily polished, and it can also be cut by the wheel, as for luster work and the like.—*London Times.*

American Geographical Elevations.

As geographer in the Rocky Mountains Expedition under the charge of Dr. F. V. Hayden, Mr. Jas. T. Gardner found it necessary to fix upon some datum point to serve as a base for the reckoning of altitudes, and met with a first difficulty in the different altitudes assigned to Denver, Colorado, they diverging between 200 and 300 feet. To eliminate the error, he undertook the "reconstructing of all possible lines of level from the ocean to the Rocky Mountains, using only official reports by engineers, and checking them by personal examinations of their note books and working profiles whenever practicable." The following are a few of the levels ascertained

	feet.
Mean level of Lake Ontario above mean tide level	249·99
" Lake Erie	573·08
" Lake Huron	589·99
" Lake Michigan	589·15
Low water in Ohio at Cincinnati	440·00
Cairo city base, ordinary low water	291·23
Saint Louis directrix	429·29
Omaha, low water base of U. P. R. R.	977 90
" depot grounds	1,060·40
Denver, Col., O. P. & K. P. R. R. passenger depot	5,196·58
Cheyenne, U. P. passenger depot	6,075·28
Golden, Colorado	5,728·98
Ogden, Utah, depot track	4,303·30
Pike's Peak	14,148·66

The level mean tide at Albany, N. Y., above mean tide at New York city, was taken at 4·84 feet, as ascertained by the Coast Survey. A few others of the hights ascertained are·

	feet.
Quebec, mean tide level	15·37
Montreal, summer water level	30·00
Lake Champlain, mean level at Whitehall	100·84
Pittsburgh, Pa., low water in river	699·20
Louisville, Ky., low water above Falls, about	404·00
New Albany, Ind., low water in 1857	379·75
" depot of L. N. A. & C. R. R.	451·75
Rock Island, Ill., high water in Mississippi in 1852	566·68
Terre Haute, Ind., high water in Wabash	485·55
" ordinary water	467·45
Mount Lincoln, Colorado	14,296·66

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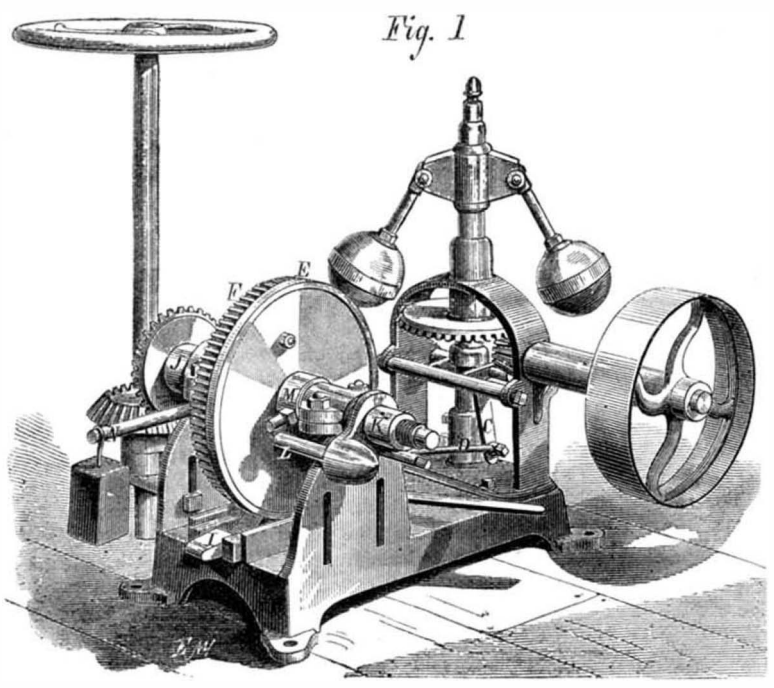
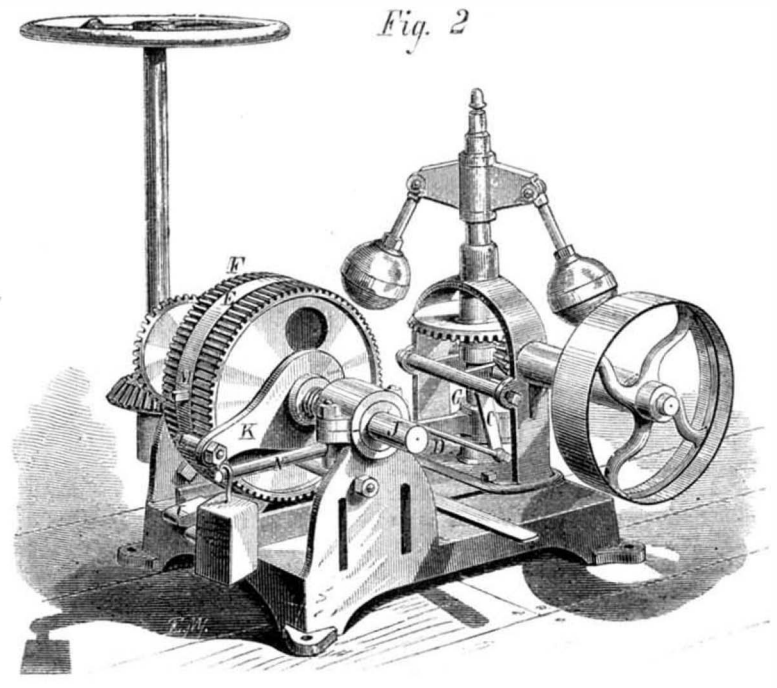
IMPROVED WATERR WHEEL GOVERNOR.

The water wheel governor herewith illustrated is one which has been in practical use for some years, meeting with a wide-spread success. It has, however, been made the subject, from time to time, of various modifications, tending to simplify its form and add to its strength and general efficiency. The engravings, Figs. 1 and 2, represent the invention in two different forms, in both of which the manufacturer has combined the latest improvements.

The mechanism will be understood from the sectional view, Fig. 3, in which A is a vertical shaft, which, driven by a pulley shaft and bevel gearing, revolves the balls. The latter actuate the collar, B, in the ordinary way, and the collar in turn works the bell crank, C. To the bell crank is pivoted the connecting rod, D, which is similarly connected with the shield, E. This last is either a disk or a sector toothed wheel, F, and is provided in either case with a notch at the bottom, as shown in Fig. 3.

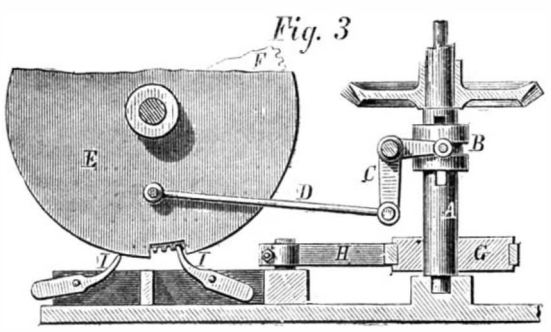




WALSH'S CHAMPION WATER WHEEL GOVERNOR.

With each revolution of shaft, A, an eccentric, G, through the rod, H, reciprocates the gravity pawls, I, one or the other of which engages the toothed wheel, F, according as the notch in the rim of the shield permits the engagement. As the collar, B, moves up and down with variations of speed, the shield is moved, by the connecting rod, D, above described, so that the notch in the shield allows of the action of the proper shaft. The toothed wheel, F, is fixed to the shaft, J, which is connected to the gate shaft by bevel gearing.

It is obvious that, when the notch in the shield stands mid-way between the pawls, I, neither of the pawls can act. Advantage is taken of this to limit the hight to which the gate can be raised by the governor. A nut and arm, K, run in a thread cut on the shaft, J, Fig. 1. The arm carries a pin, L. By the continued action of the pawl that raises the gate, the nut, K, is run along the thread on J, till it finally abuts against a shoulder turned on the shaft, and then turns with the shaft. At the same time the pin, L, is brought under a lug, M, formed on the hub of the shield. The shield is thus turned so as to bring the notch to the center, where, as neither of the pawls can act, the gate cannot be further



raised. As soon as the speed of the general shafting, to which the governor is belted, increases, the action of the collar, B, and bell crank, C, Fig. 3, moves the notch of the center so that the proper pawl to lower the gate acts as before.

Fig. 2 represents a governor made to act by two eccentrics, two systems of pawls, and two toothed wheels, so as to raise or lower the gate faster than the single system will: this style of governor being designed for certain turbines, the gates of which are operated with screws which require many turns to open or close the gate.

A friction brake, N, Fig. 1, is employed to hold the shaft, J, from turning back, as it will in some cases during the intervals between the impulses imparted by the pawls.

There is little to be added relative to this invention other than to note the fact that over 500 are now in use. It possesses the important advantages of simplicity and durability, and, according to the manufacturer, it is adapted to meet the requirements of all kinds of wheels under every circumstance.

Further particulars may be obtained by addressing Mr. A. Walsh, Cambridge, New York.

Recent Researches in Artificial Light for Photography.

We recently adverted to a new and brilliant light, said to be utilizable for photographic purposes, and based on the employment of binoxide of nitrogen and sulphide of carbon. MM. Riche and Bardy have recently conducted a series of experiments upon this and other modes of illumination, with a view of determining whether it was the carbon or the sulphur which gave to the light its photogenic properties, and as to whether it were possible to construct a lamp simpler in form and free from the danger of explosion incident to the use of the gases above named. The result of their investigations shows the following comparative statement of photogenic power: Oxyhydric and Drummond light, 1; zinc burning in oxygen, 4; magnesium lamp, 5; binoxide of nitrogen without sulphide of carbon, 6, and a jet of oxygen delivered upon sulphur, 8. From this it appears that the mixture of binoxide of nitrogen and sulphide of carbon is useless, since the simpler light last mentioned is more advantageous. The fumes of sulphurous acid arising from the latter are easily conducted away by a bell placed above the flame, communicating with the chimney of the apartment and so producing an upward draft.

Useful Recipes for the Shop, the Household, and the Farm.

A simple method of determining the quantity of cream in any sample of milk consists in agitating the milk in a graduated glass tube with its bulk of ether for four or five minutes. Add alcohol in volume equal to that of the milk, and shake for five minutes. Place the tube vertically and allow it to rest for a brief period, when the oily matter will rise to the surface so that its amount may be read off on the scale and the percentage easily computed.

A good varnish for maps is made of 1 ounce Canada balsam and 2 ounces spirits of turpentine. This is laid on with a soft brush, over a thin coating of isinglass previously dried.

To remove the stains on spoons caused by using them for boiled eggs, rub with common salt.

Oak timber loses about one fifth of its weight in seasoning, and about one third of its weight in becoming perfectly dry.

To disinfect moldy casks, first wash for about five minutes with an alkaline solution of soda, and then soak for one or two days with a liquor acidulated with hydrochloric acid.

A wound made by a knife or other sharp instrument is best healed by bringing the edges together and putting on a bandage which will not exclude the air. Nature will work the cure, if the person be healthy, much better than any salve or ointment.

A good transfer paper for copying monumental inscriptions and metallic patterns may be made by rubbing a mixture of black lead and soap over the surface of common silver paper.

An ox will consume two per cent of his weight of hay per day to maintain his condition. If put to moderate labor, an increase of this quantity to three per cent will enable him to perform his work and still maintain his flesh. If he is to be fatted, he requires about four and a half per cent of his weight daily in nutritious food.

The strongest side of a piece of timber is that which in its natural position faced the north.

A good zinc wash for rooms is made of oxide of zinc mixed with common size, and applied like whitewash. After it is dry, put on a wash of chloride of zinc, which will produce a glossy surface.

Too great care of the health at this period of the year cannot be exercised. Because a few days are open, bright, and warm, all the windows in the house should not be thrown open, the fires put out, or flannels thrown aside. It is better to err on the safe side, and endure the trifling discomfort, than, by free exposure, to invite pneumonia and other diseases common during the damp weather of a late spring.

To make liquid glue, dissolve 53 parts of best glue on the steam bath in a porcelain vessel, in 36 parts of water. Then add gradually, stirring constantly, 3 parts of aqua fortis, or enough to prevent the glue hardening when cool.

A New Fat and a New Source of Borax.

In the course of a new work recently written by Mr. Arthur Robottom, of Birmingham, Eng., entitled "A Visit to Strange Countries in Search of New Products," the author describes the curious "mutton birds" of the Pacific coast and islands. These birds burrow in the ground like rabbits, and are remarkable for their fat, which, the writer thinks, might be rendered available for lubricating purposes, inasmuch as it has a viscosity approaching to that of the oil which is found in the head of the spermaceti whale. The present scarcity, and high value of sperm oil give great importance to any kind of oil or fat which can take its place for the lubrication of cotton spindles and like motions; and hence it is believed that the fat of the mutton bird should be carefully tested for that purpose.

The same author mentions a cañon in Southern California, which leads the traveler to the bed of an ancient lake. On this bed is a marvelous deposit of borax, several feet in depth. The salt is found in huge crystals, some as large as a man's fist, and is of remarkable purity. The locality is known as Death's Valley, and some of the borax gathered there has already found its way to the markets. A greater export would be made if the road between the deposit and the coast offered better facilities for transportation.

IMPROVED MEAT TENDERER.

We illustrate herewith a handy device for rendering tough meat tender, intended as a substitute for the usual practice of pounding. The tool consists simply of an assemblage of sharpened steel blades, which are inserted in a metal socket and held apart by pieces of wood, the whole being confined by a set screw at the end of the supporting rod, so that the blades are easily removable for sharpening.

The mode of operating the invention is by drawing the cutting edge over the surface of the meat in various directions until the stringy portions are thoroughly divided, the device being held by a suitable handle, as represented in the engraving.

For further particulars address the Desper Manufacturing Company, Barre, Mass. (See advertisement which appears on on another page).

New versus Old Seeds.

Persons, in ordering their seeds for spring planting, should be sure to obtain them of reliable seed dealers. Seed will not germinate if they are too old; and disappointment and delay often result. Experience of seedsmen indicates that, if properly gathered and preserved, beans will retain vitality 2 years; beet, 7: cabbage, 4; carrot, 2; sweet corn, 2; cucumber, 10; lettuce, 3; melon, 10; onion, 1; parsnip 1; peas, 2; radish, 3; squash, 10; tomato, 7; turnip, 4.

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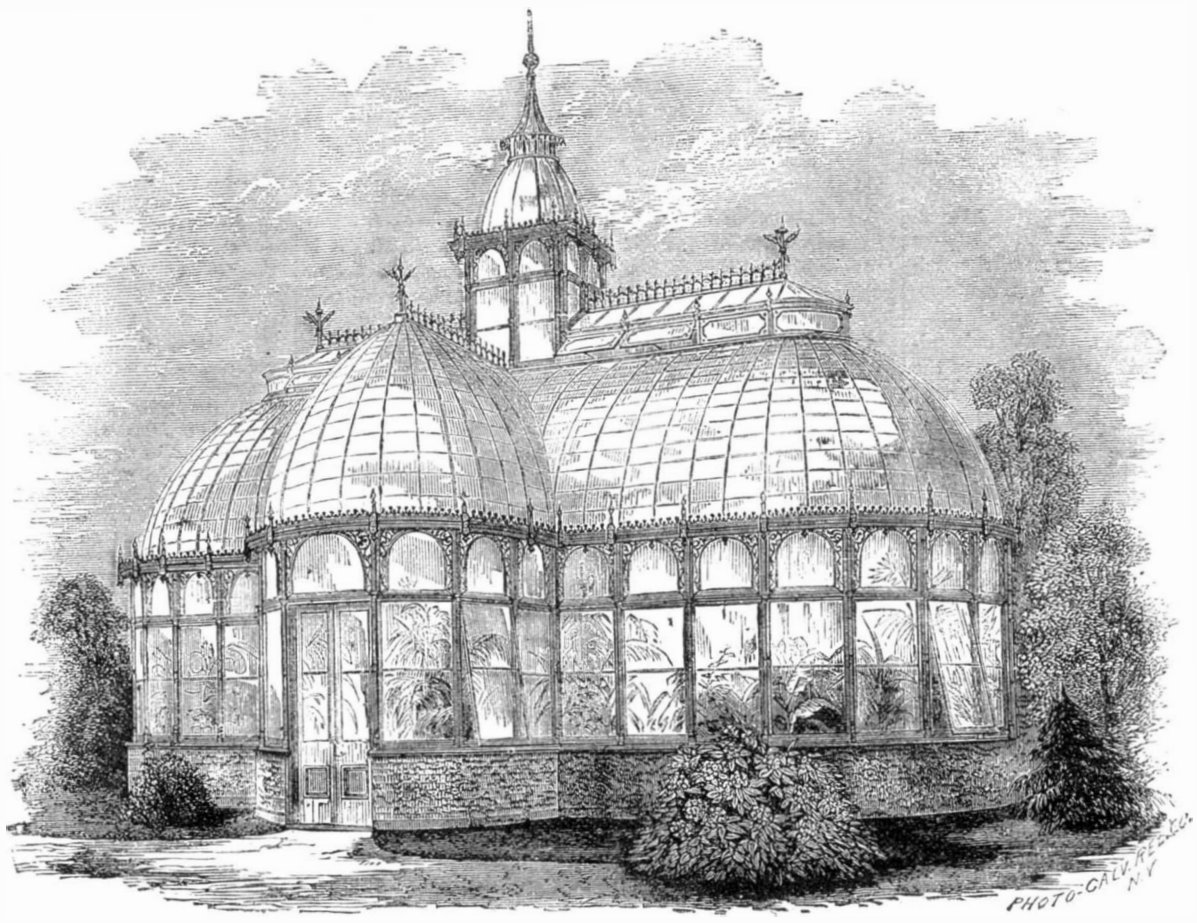
NEW DESIGN FOR A CONSERVATORY.

Our readers are no doubt familiar with many graceful structures of iron and glass for raising tropical and other plants, but the wooden erections for the same purpose have hitherto been more remarkable for cheapness and utility than for elegance. But there are many localities where iron buildings are not easily obtained, and where the most available architect is a capable and practical carpenter. To the inhabitants of such districts we commend the engraving of a curvilinear hothouse, built entirely of timber and glass. It is the invention and design of Mr. Lascelles, a London carpenter, who has given much attention to the needs of horticulture. This original and useful plan seems to us to effect a revolution in the art of hothouse building, and a very desirable revolution, too. "The curved wooden spandrils of the roof," says *The Garden*, "consist each of three pieces, bent by steam, and very accurately fitted together. Although, however, the spandrils are bent, the glass is not; and in this there is a decided advantage, inasmuch as a difficulty is often experienced in replacing broken squares when such is the case. The interior is divided into three compartments, which afford plenty of space, not only for plants of comparatively small size, but also for the larger forms of tropical vegetation."



LASCELLES' CURVILINEAR WOODEN CONSERVATORY.

Noise as a Nuisance.

In one of the Chancery courts in England, recently, a case, Beaumont *versus* Emery, was heard, of some importance to persons residing in the neighborhood of noisy manufactories. The defendant is a cooper, carrying on business in the rear part of the plaintiff's house, and had been in the habit of using a high pressure steam engine at work day and night. The plaintiff complained that the vibration and noise caused by this engine were such as to create an intolerable nuisance, and he filed this bill, praying that the defendant might be restrained by injunction from working the steam engine. The Vice Chancellor said he was of opinion that the plaintiff had established his case, and there must, therefore, be an injunction to restrain the defendant from working the steam engine between the hours of seven P. M. and six A. M., without the plaintiff's consent.

SUMMER HOUSES.

The opening of spring calls our attention to the requirements of the garden, and the arrangements necessary for our comfort during the season when we live as much as possible in the open air; and many of our readers will find some useful suggestions in the annexed engraving of a summer house, even if they do not feel inclined to carry out the plan in its entirety. The design is by Mr. J. C. Fox, of the Royal Horticultural Society's gardens, South Kensington, London; and we believe that there cannot be two opinions as to the usefulness and beauty of the structure. As it will be seen, it is raised above the surface, so that it is secure from dampness in the worst weather; its projecting gables insure the requisite amount of shade; and the climbing plants, which are its best means of decoration, seem to grow up around and to cover it, almost as a part of itself.

"What is so enjoyable in hot weather," says *The Farmer*, "as to be enabled to leave the close atmosphere of a dwelling, and retire to the coolness of a summer house, where the luxury of fresh air can be obtained without exposure to the heat of the sun?

"The desire for these erections being so general, it devolves on those who have made garden architecture their study to lead this taste in the right direction, and to place before villa gardeners structures conceived on correct principles, distinguished at once by beauty of design, strength, and solidity of construction, convenience of arrangement, and economy of cost."

This design can, of course, be varied to suit the grounds and the needs or the means of the owner; but its general appearance of comfort and rusticity is, in our opinion, pleasing to the eye, and especially appropriate to its intended use. The growing taste for horticulture, of which we have daily such abundant evidence, gives additional value to this tasteful representation.

Rheumatism in the Horse and other Animals.

Rheumatism is sometimes defined as inflammation of the fibrous tissues, tendons, and ligaments, and the fibrous coverings of muscle; but it must be understood that the inflammatory state is quite distinct from the ordinary disease. What change in the constitution of the blood is essential to the development of rheumatism is not well ascertained; but there is no doubt that lithic acid, or one of its allies, is abundantly formed and largely excreted from the system. It is probable that the same error in the nutritive functions which causes the formation of uric acid may also induce other chemical or physical changes which have not yet been recognized; but the facts go no further than we have stated. Rheumatism is a peculiar form of inflammation of the white fibrous tissues, associated with the formation of an excess of uric or lithic acid, and the presence of an unusual proportion of fibrin in the blood.

Rheumatism may be acute and general, accompanied with various degrees of fever; or it may be strictly local, and productive of no more severe constitutiona disturbance than would naturally arise from the pain in the inflamed part.

Acute rheumatism sometimes attacks the fibrous tissue connected with the muscles of the back in horses and cattle, the latter particularly, in consequence of their more frequent exposure to inclement weather. The milder form of the disease is very common among horses, and generally affects the synovial sacs in the vicinity of joints. In both forms rheumatism is always associated with a tendency to the deposit of fibrin; and in the acute variety of the affection, the serous membranes of the heart often suffer seriously, but not to the same extent in the lower animals as in man.

Causes of rheumatism are ordinary and special. Common causes, which are those most readily appreciated, are exposures to wet and cold, or sudden changes of temperature. A sudden attack of rheumatic disease will often be attribu-

DESIGN FOR A RUSTIC SUMMER HOUSE.

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ted to a journey in the wet or exposure to a draft of cold air; but these ordinary influences can only have the effect of determining the location of the disease, the necessary conditions for the development of which must have existed previously.

Symptoms of rheumatism vary according to the severity of the attack. In the acute form of the affection, there are loss of appetite, quick full pulse, rapid breathing, stiffness of movement, and sometimes incapacity to move at all. Cattle, when attacked with acute rheumatism of the muscles of the back and quarters, will often lie down and refuse to rise; and, if not got up by force, they may remain in that position until they die from exhaustion. or from failure of the heart's action owing to the extension of the disease to that organ.

Horses when similarly affected remain in the standing position, with the hind legs drawn under the body, presenting something of the appearance which is apparent in acute inflammation of the fore feet; in fact, we have known this disease to be mistaken for rheumatism of the muscles of the back, and we have heard of the opposite error being made, an attack of rheumatism in the back having been treated as inflammation of the fore feet. The symptoms of rheumatism, however, are sufficiently marked to enable an acute observer to distinguish it from any other affection.

When the inflammation attacks the joints of the extremities, one peculiarity is sufficient to indicate the nature of the malady—we refer to the tendency to shift from one part of the limb to another; the right fetlock may be swollen one day, and the left knee on the following day; and again in a short time the disease may quit the fore limbs altogether, and appear in the hind joints.

In the sub-acute form of rheumatic disease, the frequent change of position is a characteristic symptom; but in the most acute form, when the constitutional disturbance is most severe, the tendency to shift from one part to another is not so commonly noticed.

One variety of rheumatism is especially annoying as a sequel to febrile diseases. A horse, which has recovered from an attack of influenza or bronchitis, suddenly becomes excessively lame from inflammatory swellings above the fetlocks, probably of the forelegs. The disease may yield to treatment to some extent, but, almost as soon as any improvement occurs in one part, the disease assumes a more active form in another; and many weeks may be occupied in trying various forms of treatment with more or less success. In the majority of cases soundness is ultimately restored, and it does not appear that the acute or chronic form of rheumatism leaves behind it any tendency to the malady.

Treatment of rheumatism is generally based on the assumption that the disease is due, in a great degree, to the presence of an excess of acid in the blood and secretions. It is undoubtedly true that there is an excess of fibrinous material in that fluid; and there is also, in most cases, considerable constitutional debility. These conditions point to a consistent plan of treatment; it is necessary to eliminate morbid materials from the system, and to support the vital powers at the same time by generous diet.

Nitrate of potash and also carbonate of potash are valuable remedies in rheumatism, the former especially from its influence on the fibrin of the blood, while, at the same time, it excites the secretive action of the kidneys. Laxative medicines are required in the febrile stage of the disease; and when the fever has subsided, tonics may be necessary, particularly if the animal's appetite is not very good.

Local treatment is indispensable in cases where the joints, or the synovial capsules connected with joints, are involved, and experience is decidedly in favor of blistering the parts at once, in preference to fomenting with warm water or apply a stimulating liniment. The relief which is afforded by a blister is commonly very marked immediately after the remedy has taken effect, and in all instances the repetition of the dressing may be expected to produce satisfactory results. —*London Field.*

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations of the following notes (which are approximate only) and for most of the observations, I am indebted to students. M.M.

Positions of Planets for May, 1875.

Mercury.

Mercury cannot be seen before the latter half of the month. On the 22d it passes the meridian an hour after the sun, and should be looked for after sunset, farther north than the point of disappearance of the sun. It sets later and later every evening, and on the 31st it does not go below the horizon until after 9 in the evening.

Venus.

Venus, although less brilliant, can still be seen in the morning, as it rises at 3h. 30m. on the 1st of May, and comes to meridian 19m. before 10 A. M. On the 31st Venus rises at 3h. 8m. in the morning, and sets at 4h. 44m. P. M.

Mars.

Mars is increasing in apparent diameter, but is also moving farther south in declination, and is not well situated for observation. It rises on the 1st at 11h. 9m. P. M., and can be known by its ruddy light. On the 30th, Mars rises at 9h 25m. P. M., and sets on the 31st at 5h. 59m. A. M.

Jupiter.

Jupiter is now the most conspicuous planet in our evening skies. It rises on the 1st at 5h. 25m. P. M., and sets at 4h. 26m. the next morning. On the 31st Jupiter rises at 3h 14m. P. M., and sets at 2h. 21m. A. M. of the next day.

Jupiter has four moons, and they can be seen with a small glass, generally in a line nearly parallel with the equator of the planet. But sometimes they are invisible by being behind the planet, as in occultations, by being in the planet's shadow, as in an eclipse, sometimes by being in front of the planet, between us and the planets, as in transits.

The occultations and the eclipses can be seen with small instruments, but the transits cannot be seen without good glasses, the little moon being generally so much like Jupiter in color as to be undistinguishable from the planet. On the 7th, the third satellite, which is the largest, will disappear (to be seen with a glass of low power) at 7h. 11m. 41s. (Washington time) by coming between the Earth and Jupiter, in transit. On the 18th, the same satellite will disappear, by going into the shadow of Jupiter, at 7h. 59m.8s. (Washington time), or by eclipse. On the 25th the same satellite will disappear at 8h. 18m. by being behind the planet, or by occultation

Saturn.

Saturn does not rise until after 2 in the morning of the 1st, and sets a little after noon. On the 31st it rises a few minutes after midnight and sets at 10h. 30m. A. M. It is far south in declination, and, although coming into better position, is still very unfavorably situated for observation.

Uranus.

Uranus rises on the 1st at 11h. 10m. A. M., and sets at 1h. 26m. the next morning. On the 31st Uranus rises at 9h. 16m. A. M., and sets at 11h. 29m. P. M.

It may be found by sweeping with a small telescope in the region east of the Beehive in *Cancer*.

Neptune.

The diurnal path of Neptune is so nearly that of the sun that it cannot be observed at this time.

Sun Spots.

The large spot mentioned in the last report, as having appeared a second time, made its passage across the disk with no noticeable change in appearance. It was last seen on the western limb, March 29, and did not return again at the time when (by the sun's revolution) it was expected, about April 14. Two clearly defined spots of good size appeared within the eastern limb on April 10, and the photograph of the 14th (none having been taken since the 10th) shows them to be preceded by another of nearly equal size. These three are still on the disk (April 18), the pair having completed about two thirds of their passage. Besides those mentioned, spots have been few and very small during the last few weeks, and no faculæ have been observed. A little group, which was first seen on March 29, was of interest, as it was well defined and passed the center of the disk, yet not visible in the last picture taken, that of the 27th.

Silas Henry Hodges.

Ex-Commissioner of Patents Hodges, who was appointed to that office by President Fillmore, and who, for the last fourteen years, has been one of the board of three examiners-in-chief appointed by Congress to hear appeals from the decisions of the examiners, died in Washington, D. C., on April 20. He was a native of Clarendon, Vt., born in 1804, and for some years practiced as a lawyer in Rutland, in the same State. A natural predilection for mechanical science gave him great success in patent cases, and enlisted him in the service of the Patent Office, in which he acquired a high reputation for learning, acuteness, and accuracy. For some years he had been suffering from a painful internal disease, which he bore with patience, continuing his labors with great courage and fidelity. His removal from this life has caused widespread regret, and elicited many indications of the universal respect in which he was held.

Patent Office Changes.

General William H. Brown, the present examiner of trade marks, resigns his position from the 30th of April, in order to resume the practice of the law. He will be succeeded by Mr. J. E. M. Bowen, for several years connected with the interference division of the Patent Office, and now first assistant examiner in the class of mechanical engineering.

A GOOD LOCOMOTIVE.—Passenger engine J. S. Taylor, No. 105, Daniel Kenyon, engineer, running between Paterson, Newark, and Jersey City, has accomplished the remarkable feat of running 80,473 miles without repairs. The main rod brasses during the period have not been filed, and the driving brasses are still in excellent condition for further work.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of Ohio.

PATENT BUNG.—PHILIP GEIER *vs.* AUGUST GOETINGER.

[In equity.—Before SWING, J.—October term 1874.]

Letters patent to Philip Geier, of February 23, 1869, for "Improved Method of rendering Wooden Bungs Impervious to Liquids and Gases," construed and sustained.

SWING, J.:

The patent recites that Philip Geier alleges that he invented a "new and useful improved mode of rendering wooden bungs impervious to liquids and gases." In the schedule the patentee says he has invented "a new and useful improvement in wooden bungs," and says: "My invention consists in rendering wooden bungs impervious to the passage of gases, or beer or other liquor, through the pores of the wood by means of any suitable substance." The drawing shows a bung with a coat of the impervious material. Then the substance used is described, as also its manner of application. This claim is: "A wooden bung rendered impervious to the passage of fluids through the pores of the wood by means of the described or other suitable substance."

I think, from the patent, specifications, and drawings, that the invention of the patentee consisted in a wooden bung rendered impervious to the passage of gases or beer or other liquids. This is the thing he has produced. This is the end he has accomplished, and a fair interpretation and application of the language used cannot well bear any other construction.

The patentee points out the method by which his invention is produced, and the material used—to wit, by the application of impervious material to the end of the wooden bung. He also describes a particular material, which he regards as most suitable, but claims the use of any suitable substance for accomplishing the result.

The presumptions of the law are in favor of the patent and the utility of the invention; but, aside from that, the testimony establishes clearly the utility of the invention. The testimony shows that many experiments had been made, prior to complainant's invention, to produce such a thing; but they had failed to produce one adapted to the use for which they were desired.

So far as the prior use of the respondent is concerned the testimony does not show that his experiments were more successful than many others, for it shows that the bungs which he manufactured did not answer the purpose, and the use thereof was abandoned.

It is attempted to be shown in the testimony, however, that the invention had been used by other parties than those set up in answer; and it is also attempted to be shown that the invention had been described in printed publications. If the testimony clearly established either of these propositions, we might, perhaps, grant the respondent leave to amend; but they do not so clearly establish either point as to warrant the court to permit such an amendment at the hearing of the case. Such testimony cannot, therefore, be considered by the court, except for the purpose of showing the state of the art at the time of complainant's invention, and such knowledge would in nowise affect the construction which I have given to the patent.

If the pleadings properly raised the issue, I should not think the patent void by reason of the claim being to broad.

The respondent having admitted the manufacture of the invention of the complainant, by the use of substances which are within complainant's patent, is, therefore guilty of an infringment; and, as no reference is desired, and the damage shown is but fifteen cents, a decree for an injunction will be granted without costs.

[*Dunham and Forakey*, for complainant.
Shouter & Smith, for defendant.]

Recent American and Foreign Patents.

Improved Side Hill Plow.

Charles Henry Stratton, Monroeton, Pa.—This is an improved reversible or side hill plow, so constructed as to turn the furrow perfectly, and to work equally well upon inclined and level land, so as to do away with all dead furrows. The mold board is made in two parts, and so arranged that the one part may swing or turn below, and the other above, the landside of said plow.

Improved Seed Dropper.

Elias M. Morgan, Belleville, Ill., assignor to Henry Rentchler, of same place.—This invention consists of an improved piston and aperture for the distribution of seed or grain. By the revolving of a shaft, the piston works up and down through the cup. The piston is made in two sections, so put together as to form the adjustable seed openings by means of recesses in their edges. The cup, through which the piston works, is provided on either side with a groove, headed by a V-shaped recess, which strikes off the seed as it is measured at each motion of the piston, and also said recesses gather the grain or seed in toward the center or groove, and the seed thus driven to the center is held in a position to escape breakage, as the plane surface on the upper part of the piston enters the aperture.

Improved Horse Hay Rake.

James E. Taylor, Westminster, Md.—The invention relates to novel means whereby a horse rake may be conveniently operated with the foot of driver, no matter what may be his size or length of leg. It consists in an adjustable foot piece very advantageously arranged on a vertical rod, so that it can be graduated at pleasure, while the rod itself also subserves another purpose.

Improved Piano Stool.

Charles A. A. Düring and John Leck, New York city.—This invention consists of an inwardly curved or convex back support, attached in an adjustable manner to a piano stool or other seat, to be set exactly to the hight of the small of the back.

Improved Car Coupler.

James S. Hagerty, Baltimore, Md.—This invention relates to certain improvements in coupling the pole to a horse car so as to enable it to be held up by the car, and thus take the continuous strain from the necks of the horses; also in a bent rod affixed to the pole and serving the double purpose as a retainer for the coupling pin and a handle wherewith the driver may manipulate the tongue in reversing his team.

Improved Manufacture of Sheet Wax for Flowers.

Mary Jane McColl, Hohokus, N. J.—Sheets of wax are prepared by cutting out of a cake of suitable color the parts or grounding of the leaf to be produced—as, for instance, in the case of a geranium leaf, from a cake of green wax, the shape of the dark green part of the leaf. This leaf-shaped piece is introduced into a cake of wax having the color of the surrounding part or fringe of the leaf, which cake has previously been heated to such a temperature that it is near the melting point, so that the differently colored cake leaf may readily sink therein, and be fully surrounded or embedded by the heated wax. The whole is then allowed to cool off, when the cake is cut into the sheets in the usual manner, said sheets exhibiting, at uniform thickness, the various differently colored leaf patterns or imitations embodied therein. These sheets are lined or backed by a sheet of wax, to give the required degree of strength, and are thus supplied to the trade.

Improved Gang Plow.

James B. Hunter, Ashley, Ill.—To the right hand plow beam the draft is attached. The left hand plow beam is bent inward and bolted to the side of the other beam. A U-shaped bar is secured to the axle, and to its bend is secured the lower end of a standard, the upper end of which passes up through the tongue, and is secured to said tongue by a bolt, several holes being formed in said standard to receive the said bolt, so that the tongue can be conveniently raised and lowered upon the standard to adjust the plows to work deeper or shallower in the ground.

Improved Brick Kiln.

Peter Edward Smith, Liscomb, Iowa.—This invention relates to certain improvements in brick kilns, and it consists in the combination of a transverse wall having dampers, with a central longitudinal hollow wall containing flues which lead to a common chimney. It also consists in the combination of detachable fire boxes with the stationary fire boxes in the outer wall, and with the flues in the hollow wall.

Improved Plow.

Albert Hampe, Staunton, Ill.—The plowshare is produced of four sections, which fit closely at the joints, and are of such shape and size as to correspond to the degree of work and strain bearing on them. A plate extends laterally and parallel to the lower edge of plowshare, being curved in similar shape and welded to the landside. The point has a horizontal base and a dovetailed recess or notch to receive the forward end of the landside and of the plate. This causes the landside and share to be supported rigidly in position, and to safely endure comparatively great strain and leverage.

Improved Seed Drill and Planter.

Lysander L. Haworth, London, Ohio.—By this peculiar plow a narrow channel is formed in the soil to receive the seed, which is dropped into the said channel through the cavity between the side parts of the plow, and is covered by the falling of the soil as the plow advances, the soil being pressed down upon the seed by the wheel. For working in sod land, a curved runner with a sharp forward edge is attached to the plow, or is used instead of said plow.

Improved Chimney Cowl.

Andrew J. Robinson, Troy, N. Y.—In the revolving section of the exhaust pipe, through which ventilation is to be effected, a partition is placed obliquely, for causing the stream of air passing through to traverse the upper part, to afford greater space for the air coming out of the exhaust pipe.

Improved Truss.

Delancy King, Salamanca, N. Y.—This consists of a pad formed of four, more or less, hinged fingers the position of which is controlled by an adjustable ring.

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Improved Latch and Knob Lock.

Charles Seymour, Charlottesville, Va.—The object of this invention is to provide a simple and effective lock for all kinds of doors, without the use of springs; and it consists in the peculiar construction of a bolt operated by its own weight, and in the combination with the same of a tumbler contained within a concentric barrel, whereby the bolt is locked at night with greater security.

Improved Machine for Rolling Tapered Bars.

Thomas R. Venners and Richard Rowley, Cumberland, Md.—This is an improved roll train, by which bars of iron or other metal of any section may be rolled to any gage, length, or taper. It consists in the combination, with a lower stationary roll, of an upper sliding roll, that is governed by the action of the eccentrics of a revolving top shaft on the steel pins of the roll bearings, in connection with the arched top straps bolted to their guide carriages. The roll train may be readily set, by the removal of the lower gear wheel, to perform the functions of the common rolls, provided that a suitable stop is attached to the eccentric shaft of the top wheel for securing the exact distance of the rolls.

Improved Pocket Book Safety Attachment.

Edwin G. Wheeler, Winona, Min.—A couple of arms are arranged on the side of the book, to be thrust out at one end by a spring against the pocket, and spread apart, so as to prevent the book from being picked out of the pocket. The arms are arranged on fixed joints, and a bar serves, in connection with a lever, to lock them open.

Improved Piano Stringing and Tuning Device.

William F. Kearsing, New York city.—This invention consists in connecting the strings to stationary rest pins by a U-shaped staple, one leg of which is screw-threaded to receive a nut, and the other is parallel thereto and passing through the rest pin, thus serving to prevent the device from turning with the adjusting nut when the tension of the strings is being regulated.

Improved Wrought Iron Column.

John B. Cornell, New York city.—This invention consists in a fender for a supporting column connected to the foundation plate, to form a lateral support to the column.

Improved Railroad Pinch Bar.

Cornelius Ragan, Waterloo, Iowa.—The base piece of the pinch bar is connected with the plate which covers the rail by a swivel pin. This base piece extends upward and has two jaws, through which passes the fulcrum pin of a lever. A tenon on the under side of the lever fills the space between the jaws, and receives the fulcrum pin. The base of the pinch bar being swiveled to the plate, the lever may be used quartering beneath the wheel, if desired. As the wheel moves along on the rail, the pinch bar and plate are pushed after it, being confined to the rail by the bended edges of the plate, which inclose the rail.

Improved Car Coupling.

Charles C. Garrett, Calvert, Tex., assignor to himself and Louis M. Openheimer, same place.—When the cars are run together, the end of the entering link pushes back the lower end of a pin and passes it, which allows the pin to swing forward into the link to couple the cars. To adjust the coupling, so that the cars can be run together without coupling, certain portions are raised sufficiently to raise the pin out of the slot in the drawhead. The lower end of the pin is then swung out, and bars are lowered, leaving the end of the pin resting upon the top of the drawhead.

Improved Feed Cutter.

Johann A. Schwerdt, New York city.—This invention consists in an arrangement of feed rollers, pawl levers, connecting rods, a treadle lever, and a wheel carrying two blades or cutters, and mounted on a crank shaft, said parts being so connected that the rollers are simultaneously operated at each half revolution of the wheel, and the straw or other material fed forward just previous to the cutting stroke of each blade.

Improved Stove-Lid Lifter.

Robert R. Ball, West Meriden, Conn.—The lifter, from near the toe to the handle, is made concave on the underside and convex on the upper side, the concavo-convex portion terminating on a disk, but extending from the other side of the disk to a handle, forming a cap. The ferrule is slipped on next the disk and the handle is driven in, and a holding nail inserted.

Improved Hay and Cotton Press.

Benjamin J. Day, Evansville, Ind.—This is a press having a horizontal case and a horizontal follower, which is worked by a train or reducing gears working into toothed bars connected to the follower, to press the hay or other matter. The essential feature consists of a novel contrivance of the train in a simple and cheap way, for giving a quicker speed to the follower during the fore part of the operation, when the resistance is not so great as in the latter part, and for giving a slower speed in the latter part, when the resistance is greatest.

Improved Machine for Forming Gear Wheel Molds.

James Clayton, Portsmouth, Ohio.—The mode of forming the mold is as follows: The bottom is first formed by a mold board on the bed of the machine, the marker is then placed on the outer division of the flange ring, and the guide arms firmly fixed thereon. The tooth pattern is then lowered, and the sand firmly rammed in between it and the flange ring. The pattern is then raised, and the marker and guide arms adjusted for the next tooth, and the space rammed with sand, as before. This operation is continued until all the teeth of the gear wheel are molded.

Improved Neck-Tie Fastening.

Emile Berliner, New York city.—This is a metallic or wire hoop, adapted to fit upon the neck or shank of a collar button, and thus suspend the tie in a simple and permanent manner.

Improved Grain Drill Teeth.

Isaac B. Sandusky, Lexington, Ky.—This invention consists in the construction of the drill tooth and seed spout in two corresponding parts, which, when secured together, furnish bearings for a cutter wheel that revolves between them and enters the ground in advance of the tooth.

Improved Automatic Cradle.

William Kindermann, Troutville, Pa.—The cradle is set in motion by a gentle push, and keeps up the rocking by the action of a clock train and pendulum rod. The cradle may be stopped when the baby is asleep, being again set to rock by the impatient and restless motions of the awakening child, forming a complete self-acting baby tender.

Improved Nail Plate Feeder.

William H. Field, Taunton, Mass.—The forked and slotted feeder bar or rear extending standard is attached to the main yoke standard and provided with adjustable stops, in combination with a sliding and weighted feeder head, which has pivoted and spring-acted jaws for taking hold of the flanged sleeve end of the nipper rod. The sliding feeding head is also provided with a rear extending latch hook and vertically sliding pin, acting on the opposite arm of the same, for raising the latch from the rear stop, and detaching the feeder head on the insertion of the nipper rod and on the consequent depression of the pin.

Improved Combined Try Square and Bevel.

John L. Larrison, Schooley's Mountain, N. J., and Henry Leigh, Wurtsborough, N. Y.—To the semicircular end of this tool an adjustable and graduated rule, with a longitudinal slot, is applied in such a manner that it may be moved along a pivot pin to any point of the slot, and also be swung thereon, to form any suitable angle with the main piece. The rule may thus be carried to the end of its slot in either direction from the main piece, so as form a square or bevel with the same, and also in the exact protraction of the same, by sliding with its end into a recess of the main piece, producing one straight rule therewith. The exact position of the rule to the required angle may be quickly adjusted by means of a sliding rod, which is guided in a longitudinal groove, being provided with a pointer, which is set to a graduation of the main piece, while a pin at the end of the rod passes through the slot of the rule and swings the same into the exact angle indicated by the pointer.

Improved Clothes Frame.

Chester F. Smith Torrington, Conn.—The drying frame is suspended from the ceiling of the room by brackets on the ends of the side pieces. These brackets are attached by joint pins, and swing freely in either direction thereon. A stud on the brackets, the end of which bears against the ceiling, throws the frame into an inclined position.

Improved Car Coupling.

Owen T. Baker, Wamego, Kan.—The cavity of the bumper head is made large, to receive two valves, which are pivoted to the bottom and top of the bumper. The lower part of the valves is beveled or inclined to press against the end of the link and hold it horizontal, and to form flanges upon their upper edges to operate upon the coupling pin. The upper pivots of the valve project into a chamber formed upon the top of the bumper, and to these are rigidly attached levers, with which are connected the ends of a spring. To adjust the coupling to connect the cars as they run together, the lower end of the pin is set upon the upper edge of the valves; then, as the cars are run together, the entering link pushes back the valve, and the pin drops through the link.

Improved Hog Trap.

James F. Cooper and William W. Hiatt, Frankton, Ind.—This is an improved trap for catching and holding hogs while ringing, marking, castrating, or spaying them, or performing any other desired operation upon them, holding the hogs securely and in such a way that they cannot injure themselves. In using the trap, one or more of the hogs is driven into it, and the door is closed. The lower end of a board is swung outward sufficiently to allow one of the hogs to put his head through the opening in seeking to escape, and the lower end of said board is then pushed inward so far as to prevent him from withdrawing his head. The hog is then thrown upon his side.

Improved Stove Pipe Coupling.

Robert R. Ball, West Meriden, Conn.—Beads are made near the ends of the pipe, and the parts are slipped over the ends and down to the beads, where the ends of the pipe are turned down with the pene end of a hammer. Slots are made in one part, and directly over the slots and above a shoulder on the other part are hooks. The two parts of the coupling are held together by hooks over a flange. Inclined planes, as one part is turned around, pass under the hooks and draw the parts of the coupling tightly together, thus making the two joints of pipe rigid and strong. This coupling utilizes the entire length of the stove pipe, saving about three inches in each joint.

Improved Protractor.

Alvin H. Dodd, New York city.—The graduated arc has a fixed arm, whose base is a true line from the center, and extending through the zero point. On the said arc are one or more movable arms which travel thereon, and the outer periphery of the arc is made with an incline, which bears against a similar incline in the recess on the arm. When a plate is clamped by turning a thumb screw, it will bear down on the arc, and thus cause the arm to be drawn closely to the inner periphery of the same.

Improved Photographic Picture Exhibitor.

A. Luquince High, Mount Holly, N. J.—An outer inclosing frame has a glass-covered face plate provided with one or more apertures, and a central spindle on which revolving picture-supporting frames turn. The revolving frames have suitable apertures and slides for inserting the photographs, and are set in motion by means of a circumferential cog wheel of the last frame, in connection with a pinion turned by a crank or key. The revolving frames are turned one after the other by lugs engaging the adjoining pictures, and suitable spring brakes.

Improved Combined Horse Hoe and Plow.

Albert D. Simons, Windsor, Conn.—In this invention a horse hoe and plow are combined with and attached to a beam of peculiar adaptation to be mounted on a wheel truck for joint or independent action, and so as to be conveniently raised out of or let down into the ground. The machine is intended for plowing and hoeing corn, cotton, and other plants growing in rows, simultaneously on both sides by straddling them, so that the plows and hoes of opposite sides of the machine dress opposite sides of the rows.

Improved Windlass.

Fletcher S. Rowland, Chaplin, Ky.—This improved windlass or hoisting apparatus consists of such an arrangement of the loose and sliding ratchet box with the windlass shaft, and a separate crank shaft and clutch, that the windlass is turned for hoisting in the usual manner; while, for lowering, the clutch connection is released and the descent controlled by the brake action of the ratchet box.

Improved Pantaloons Stretcher.

John D. Ryan, New York city.—This is a device for application to pantaloons, to remove the knee folds and wrinkles that have been formed in them by use, leaving them straight and smooth. In using the device, clamps are secured in the pantaloons. An extension rod is adjusted to the proper length, and its ends are inserted in holes in the bars of the clamps. A swiveled screw is then turned to put the pantaloons under the necessary tension.

Improved Apparatus for Stamping Patterns.

Isidore Rosenthal, New York city.—This stamping apparatus is composed of a cloth-supporting table, with guide pins, and a balanced suspended transfer frame, having the perforated pattern paper stretched thereon, and adapted to be raised and lowered by suitable mechanism. The transfer frame is provided with adjustable intermediate pieces, and clamping top strips, for adjusting and stretching the transfer paper to any width of pattern.

Improved Match Box.

John Knox, Auburn, N. Y.—A slotted shell receives a head which has a groove in one end, and at the other a head, open in the center, to receive an internal cylinder. There is also a side notch to receive a pusher. The cylinder has longitudinal grooves for the matches, and is attached to a swiveled pin in one end, and fastened at the other on an internal projection of the cap. It also has a ratchet, in which works the fixed spring pawl, to prevent it from turning backward. The caps may be removed and the grooves filled with matches, while a further supply may be kept inside the cylinder. A friction spring ignites the match as it is thrown out by the pusher.

Improved Ironing Board.

Eli J. Wolfran, Washingtonville, Ohio.—This invention relates to certain improvements in ironing boards; and it consists in the combination with an encompassing elastic band, of solid incompressible border strips adapted to be forced into grooves in the edges of the ironing board, by means of the said elastic band, for the purpose of holding the cover on more securely, the said solid strips affording three sides which engage with the edge of the cover in the groove with a frictional contact, thereby holding the cover on more securely, and without allowing it to wrinkle, as would be the case with an elastic band alone.

Improved Station Indicator.

James D. Smith, Gregg, N. Y.—A series of flaps are hinged on transverse wires in the middle of the case. By means of stops they are arranged in an inclined position, so that, when released by moving the bar at the upper end of the case, they will fall over by their own gravity, aided by a spring. The bar is attached to a slide, which is confined to the case. By pressing on the long end of a spring lever, the bar will be raised sufficiently to allow the first leaf to drop and admit the next one to the notch, and so on, as the stations are passed.

Improved Chain Propeller.

Clark Smith, Cornwall on the Hudson, N. Y., assignor to himself and William H. Clark, of same place.—This is an improved endless chain paddle wheel, which is so constructed that the paddles may move back and forth between the wheels in straight lines, and this without any sag, and at the same time with very little friction. A series of paddle blocks are jointed together and provided with side flanges, and upper and lower ways provided with top, bottom, and side rows of friction rolls.

Improved Folding Table.

James W. Howland and Della Howland, New Haven, Conn.—Two sections of the table are hinged together at the joint by treble jointed hinges, which are fitted in recesses in the edges of the top below the upper surface, so that the hinges will be hidden when the table is extended. The legs are pivoted to the table in a socketed block, having one wall of the socket removed, so that they can fold down against the table top; and a detachable fastening pin is substituted for the said side, and so contrived that it will fasten the leg both when extended and when folded, thus serving both for a brace and a fastener for holding the leg in the folded condition.

Improved Fumigator for Greenhouses.

Thomas Shaw, Danville, Pa.—In using the machine, the tobacco or other substance to make the smoke is placed in a hopper, and a live coal is placed upon it. A wheel is then turned in such a direction that the fans will draw the air in through the hopper and discharge it, loaded with smoke, through a pipe. In this way the entire greenhouse can be entirely filled with smoke in a very short time. With this construction the device can be placed and operated upon the outside of the greenhouse, the pipe being inserted in a hole formed in the door for that purpose.

Method of Hoisting and Conveying Coal, etc.

George Stancliff and Joseph Green, New York city.—This invention consists of a carriage moving on an inclined railway, and provided with fulcrumed lever hooks and cross pin for suspending the bucket thereon. An arrow-shaped suspension rod of the pulley blocks locks over the cross pin of the levers, and is released therefrom by slightly hoisting the hook till it engages a guard plate, which carries the hook below the cross pin without engaging the same. The bucket is tripped for discharging its contents by detaching a latch hook pivoted to its bail, and binding on the rear edge, by means of an adjustable and sliding trip hook, which is pivoted to the carriage, and governed by the hoisting cord of the bucket. The fulcrumed lever hooks are arranged at both ends of the supporting carriage, and constructed with arrow-shaped ends, that lock on pins at end stations that define the length of the way. A sliding weighted cross pin of the station serves to lock the upper hook of the fulcrumed levers on the arrival of the bucket, while the lower hook, arranged nearer to the end of the lever, locks over a lower fixed pin on the detaching of the bucket, being released by the weight of the resuspended bucket, and detached from the station as the upper hook raises the sliding pin, without engaging the same.

Improved Grain Separator.

Wenzel Toepfer, Milwaukee, Wis.—This consists in the combination of an inner brush, its adjustable supporting arms and binding screws, and the vibrating sieve contained with the cylinder, whereby the motion of the sieve is imparted to the brush to give it a longitudinally reciprocating motion. It also consists in an inclined adjustable blade, attached to and moving with a trough for receiving the impurities and conducting them away. A longitudinal brush, with blade and trough, is attached to and moves with the sieves, and is placed along the inner side wall of the cylinder for cleaning the indentations from the impurities gathered therein and carrying them off.

Improved Envelope Opener.

John La Blanc and Xavier St. Pierre, Ophir City, Utah Ter.—This consists of a pair of guides projecting from one end of a metal socket piece, adapted to fit over the end of a pencil to form a V groove. At the bottom a little cutting blade projects to cut open the edge of the envelope, which is guided against the blade when the envelope is drawn along between the said guides, or the latter forced along the envelope.

Improved Mowing Machine.

Jason P. Lord, Francis E. Lord, and Orrin E. Lord, Readsborough, Vt.—This mowing machine is so constructed as to greatly diminish the friction in operating it, has no side draft, and will allow the cutters to be taken off one at a time to be ground, or to be replaced with new ones when broken.

Improved Drop-Chute Reverser.

Joseph B. Crowthers, Monongahela City, and William R. Wilkins, Pike Run, Pa.—This invention improves the construction of the drop chutes in common use for loading coal into boats, barges, and other vessels, so as to enable them to be more quickly and more easily reversed than when constructed in the ordinary way, and so as to be conveniently adjusted to correspond with the rise and fall of the water in the river.

Improved Bill File.

Richard H. Hoffman, Keyser, W. Va.—The bottom has three cups, in which are placed conical spiral springs, which bear upward against the table with a constant pressure. The bed is bent upward at right angles with the cups, and then is bent forward and forms the top plate of the file, against which the table bears when the file is empty. Ordinarily the file will rest upon the desk or writing table, standing on the cups. A piece corresponding in form with the lower portion of the bed is attached to the under side of the table, having shallow cups for confining the upper ends of the springs. This plate carries on its back a cross, which works in a slot and holds the table in position.

Improved Fire Tongs.

Lucian Holmes, Tullahana, Tenn.—The invention is an improvement in the class of fire tongs, whose legs are provided with a guide to prevent their passing each other when opened. The means employed consist of bars pivoted together and to ears or flanges formed on the legs of the tongs.

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Notes & Queries

A. F. K. will find a description of a breech-loading cannon on pp. 149, 402, vol. 27.—A. S. H. will find that galvanizing cast iron is described on p. 59, vol. 24.—D. G. & S. will find directions for annealing steel on p. 107, vol. 29.—A. R. N. can tan buffalo hides with the hair on by the method described on p. 59, vol. 29.

(1) A. R. C. asks: 1. Will copper (such as the bottoms of wash boilers or tea kettles are made of) do for a boiler to run a small engine? I want it to run for 6 hours and be heated by kerosene. A. A boiler to run an engine of this size, and do any work, could not conveniently be heated by a kerosene lamp. It may be made with a central flue, using charcoal as fuel. 2. How low can water be safely in a boiler? A. It is well to set the gage cocks so as to keep the boiler at least half full of water.

(2) A. T. W. asks: 1. What is meant by the pitch of a propeller? A. The pitch of a propeller is the distance it would advance in one revolution, if it turned in an unyielding medium, like a screw in a nut. 2. Is a cylinder 1x2 inches large enough to run a boat three feet long and about the same proportions as the Mab, described in your issue of March 20? A. Yes. 3. Of what dimensions should I make the boiler? A. About 12 inches in diameter and 15 inches high. 4. Could I run a larger boat with the above mentioned diameter? A. Yes, one twice as large.

(3) E. L. asks: How can I remove oil or grease spots from a wooden floor? A. In some cases, it can be washed out with a solution of potash; but generally you must take out the board to take out the stain.

Is the following rule for finding the number of feet of board that can be sawn from a log correct? From diameter in inches deduct 4, multiply the remainder by ⅛ of itself, and multiply that product by the length of the log, and divide by 8. A. There is no rule so far as we know that is applicable to all cases.

(4) J. M. says: 1. My engine cylinder is 1¼ x2¾ stroke, steam pressure 25 lbs., speed 150 revolutions per minute. What is its power? A. We suppose the engine is working at about ⅛ of a horse power. 2. Would a boiler of cylindrical form, with 6 flues, and a furnace of ⅛ inch wrought iron, so attached that the heat can pass under the boiler and return through the flues into the stack, do for engine use? A. Such a furnace would be apt to burn out. 3. What is a test tube, and how is it made? A. It is simply a glass tube closed at one end.

(5) J. E. R. asks: What is the most effectual way of keeping chickens clean and free from vermin? A. Rub upon the roosts, once in every 3 weeks, a little coal oil. Never set the hens on nests that have been used much. If the little chicks are affected, a drop of lard upon each head has been highly recommended; or a weak solution of carbolic soap can be used on their heads, which will completely exterminate the pests.

(6) W. H. says: I noticed in the SCIENTIFIC AMERICAN of February 20, 1875, a recipe for giving an oaken color to pine (copperas, dissolved in strong lye). I did not know what kind of ley, so I slaked some lime, taking the water (after it had settled) to dissolve the copper, and applied with a brush. It was a failure. I tried potash, with no better result than to destroy a nice new brush. All this experimenting was on a new table, which my wife used to sprinkle the family washing upon. The result was that wherever a wet spot touched the table it has turned it yellow, and stained the goods with yellow spots. What is the remedy? A. Strong potash lye, or a concentrated solution of potash in water, was what is meantin the recipe. We understand you to say that you attempted to dissolve copper in the ley, whereas the recipe distinctly said copperas, which is otherwise known as green vitriol or sulphate of iron. The wood should be steeped in the solution; and when the desired color is obtained, it should be thoroughly washed in water, dried, and varnished with shellac in alcohol. If you will send us particulars as to what you used on your table, whether solution of copper or iron, we will endeavor to help you to remove the stains from your linen.

(7) C. W. asks: If a rifle ball be shot into a two inch oak board so as to penetrate it, and the gun reloaded with the same amount of the same sized powder, and fired up into the air perpendicularly, when the ball comes down, would it penetrate a two inch oak board? A. It would not, as the resistance of the air would decrease its velocity.

(8) P. asks: 1. What is the essential difference between the Hirsch and Griffith screw propellers? A. The two screws differ from each other in the form of the blades and the variation of pitch. 2. What pitch should a 5 feet three-bladed wheel have to give the best results? A. A common proportion would be to make the pitch 8 feet. 3. What would be the percentage of slip? A. With a well designed boat, there would probably be from 15 to 20 per cent of slip.

(9) B. W. asks: 1. What is the exact variation of the magnetic needle in the latitude of Wilmington, N. C.? A. We do not know that this information is published; but by writing to some of the officials of Wilmington, you may get your question answered. 2. How can I test the polarity of my compass? A. By finding a true meridian, from observation of the sun or a star. You will find a method explained in another column of this issue.

(10) H. R. W. asks: How much mixed paint will it take to the square of 100 feet surface on outside work? A. According to Trautwein, the first coat of paint will take 6½ lbs. to the square of 100 feet, 3⅔ lbs. to the second coat, and 2¾ lbs. to the third coat and each subsequent coat, the paint being white lead, and weighed before thinning.

(11) H. C. L. asks: If I were riding in a car going in an easterly direction at the rate of 30 miles an hour, and wanted to jump off, which would be the proper direction for jumping? A. We do not think it would make much difference which way you jumped from a car going at that rate of speed.

(12) L. W. J. asks: I have a small engine, of 1½ inches bore, 3 inches stroke. What would be the most appropriate style of boiler to run it with? A. You can make an upright boiler, with a flue in the center. Diameter of shell, 15 inches: diameter of flue, 4 inches; hight of boiler, 30 inches.

(13) F. K. says: We have, for the purpose of reducing large lumps of coal into smaller, 3 sets of rolls or cylinders, studded on their peripheries with points or teeth; these have become dull in time and we desire to resharpen them. The cylinders and teeth are made of cast steel, and to chip them is a tedious and imperfect process. Can we not generate a gas, conduct it to the tooth to be sharpened, heat it sufficiently, and hammer out the point? A. We believe that you could effect it better by the use of emery wheels, which could readily be arranged to do the work. If you wish to heat the points, however, we presume you could do it most readily by the use of a blowpipe of proper construction.

(14) J. W. A. asks: In my engine, the area of plate or valve is 12x12 inches, pressure in steam chest is 100 lbs. per square inch. What amount of power is necessary to slide the plate or valve on a blank surface, the two surfaces having been planed and scraped as valves and seats are usually done? The opening under the valve in the valve seat is 1x10 or 10 square inches in area. What is the amount of power necessary to move or slide the valve covering the above opening? Which of the two above mentioned will require the least power to slide it on its respective seat? A. The power will be the same in each case, if, as we understand you to mean, there is no upward pressure on either valve.

(15) W. H. S. asks: 1. What is the value per cubic foot of charcoal, compared with soft bituminous (Iowa) coal, and with hard wood, for firing a steam boiler? A. Coal 1, charcoal ½, wood ⅙. 2. I have an engine with a rotary or rock cut-off valve. With 100 lbs. pressure, doing heavy work, I occasionally found the valve to grate immediately after putting on tallow, which grating generally lasted abont five minutes. I tried lard oil and castor oil with the same result. I tried sulphur and tallow, when the valve worked very satisfactorily. I worked it about five weeks with sulphur and tallow, and found the cylinder was worn $\frac{1}{16}$ of an inch larger at the middle than at the end. Did the sulphur have anything to do with it? The valve seat, cylinder, and rings are very smooth and bright. A. It is more likely that the trouble was caused by some lack of proper adjustment.

(16) C. R. B. asks: Why is it that the yolk of an egg cannot be beaten as stiff as the white? A. It is due to the fact that a large proportion of the yolk is composed of oil.

(17) O. C. B. asks: 1. I have a boiler 20 inches high by 15 inches diameter, with 27 tubes. Boiler is of ⅜ inch cast iron, with heads of ½ inch cast iron. How much steam would it be safe to carry? A. We would not advise you to carry a pressure of more than 15 lbs. in such a boiler, and we think it would be much better to build one of wrought iron or copper. 2. How large an engine would it take to run a small lathe, 24 inches long, at 600 revolutions per minute? A. Diameter of cylinder 1½ inches, length of stroke 3 inches.

(18) H. S. M. says: I was recently consulted by a friend who is about to enter into the manufacture of a combined ice chest and refrigerator in which he intends to substitute mechanical force for the usual daily supply of ice, that is, he intends to form ice in the chest by mechanical action, the motive power being a man operating, through a crank or lever, a small ice machine contained in the chest itself. The machine is to be of the ether type, in which a quantity of some very volatile liquid is made to boil in a partial vacuum. I was asked: How long will it take a moderately strong man to make 10 lbs. of ice from 10 lbs. of water at 70° Fah., providing that the apparatus be as nearly perfect as possible? I computed it as follows, and my client is of opinion that I am wide of the mark: 10 lbs. water will have to be relieved of 38° Fah. of its latent heat to reach the freezing point; and as 1 lb. of water heated 1° constitutes the unit of heat, hence 10×38=380 units of heat which have to be taken out of the water before ice forms at all. Then again, on the water passing from a liquid to a solid form, it will set free 140 units of heat for each pound of ice formed, and at the same time remain at the same temperature itself. Therefore 140×10=1,400, and 1,400+380=1,780 units of heat to be converted into mechanical force and converted back into heat in the condenser of the machine; and as every unit of heat has a mechanical equivalent equal to raising 772 lbs. 1 foot high, we have 772×1,780=1,374,160 foot pounds, which, being divided by 33,000, gives 41·63, or the number of minutes during which 1 horse power is required to raise 1,374,160 lbs. one foot high, or to reduce 10 lbs. of water from 70° Fah. to ice; and as it requires seven men to exert 1 horse power constantly, it will require one man seven times as long; therefore 41·63×7=291·41÷60=4·84 hours as the time that one man would be required to work the pump to produce 10 lbs. of ice. To this must be added 25 per cent for friction and absorption of external heat, which brings the sum total up to 6·05 hours. Am I right? A. The calculation is correct for the theoretical time, and is very creditable to you. It is probable, however, that still greater allowance must be made for friction, leakage, radiation, etc., than the one you have estimated.

(19) C. D. asks: By what process can I produce crystalized effects, such as we see on water coolers? A. If can be done by mixing ground mica with collodion, and applying to the surface.

(20) E. S. F. says: 1. We purchased some woodworking machinery which has been standing still for some time, and consequently has become gummed. Will kerosene oil be as good as anything to remove the gum, or had the machines better be taken all apart and cleaned? A. It will be better to take the machinery apart. 2. Will kerosene injure the journals and boxes if put on when we commence running? A. Kerosene oil will not injure the journals, but the dirt and grit on them may if you start up the shafts before cleaning them.

(21) C. F. S. asks: How do you explain the fact that water, being placed in a cellar in an open vessel, will keep vegetables from freezing? It has been done here this winter with success, protecting apples and potatoes from frost. A. If you will give us further particulars we will investigate the matter. We do not think the presence of the water was the preventive.

(22) H. B. says: We are making a quantity of cast iron augers, about 12 inches long and from 4 to 8 inches diameter at the outside of threads. The threads are about 1½ inches apart and of about the same depth. We wish to polish these with an emery belt, having first removed the rough exterior by an emery wheel. Is a leather or rubber belt best? What kind of glue is best? A. Use leather and ordinary glue of good quality.

(23) D. B. C. Jr. says: 1. I wish to build a light boat, 30 feet long by 7 beam, to draw 12 inches water. Please give me the size of boiler, engines (for side wheels), diameter of side wheels, length and depth of buckets. A. Engine 4x6 inches, and boiler 3 feet diameter and 4 feet high. 2. Which would be the best, a side wheeler or a propeller for a stream with a rocky bottom? A. It will be best to have a propeller, or twin screws.

(24) D. W. W. asks: 1. What is the difference between plumbago and black lead? A. None.

Is the mineral known as fiberous asbestos good for packing piston and valve rods on steam engines? A. Yes.

How can I make a brown or black enamel or paint, for cylinder heads and steam chests, which will not crack and scale off as common paint does? A. There is a black varnish made from mineral oil that answers very well. See p. 379, vol. 31.

(25) J. C. Jr. says: I have a steam engine and wish to know if you can inform me why the boiler foams. I fancy that the steam pipe is too small, or possibly the boiler itself may not be large enough for the engine. The builders say that, after she has been two or three months running, she will come all right; but I find she has not improved after an experience of six weeks. A. The trouble is probably caused by dirty water. If so, blow off frequently, and clean the boiler.

(26) H. M. D. asks: Will you please tell me how soot may be used to advantage? A. Wood soot may be used as a fertilizer.

How may I get rid of the grub worm from trees and bushes? A. Dig down about the base of the trunk about 12 inches, and incase it snugly with tarred paper to about one foot above the surface of the ground; then fill in the soil.

What are the ingredients of nitro-glycerin? A. It contains carbon 3 equivalents, hydrogen 5, nitrogen 3, oxygen 9, $=C_3H_5N_3O_9$.

(27) I. W. S. asks: If I insert a platinum wire into a U-shaped tube, fill the tube with a mixture of oxygen and hydrogen, place the mouths of the tube in a vessel of water and connect the ends of the wire with the poles of a battery, will

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the tube be broken when the combination of the gases takes place? A. If the tube be a strong one, and has large openings at the mouths, it will not.

How can I make a paste or mucilage which will dry quickly, and not make the paper curl up? A. Use a solution of pure gum arabic in warm water, and mix a little refined sugar with it.

(28) G. A. Z. says: I am working an improvement on the common smoking pipe, and have to use some metal inside the bowl, in contact with the burning tobacco. Would brass be injurious to the smoker? Would nickel be more suitable? A. Nickel or nickel-plated brass would be the better for this purpose.

(29) G. B. B. asks: In your formula for amalgam for silvering hollow glass vessels, etc., what qualities of lead and tin are meant? A. Melt together 1 oz. clean lead and 1 oz. fine tin in a clean iron ladle, then immediately add 1 oz. bismuth. Skim off the dross, remove the ladle from the fire, and before it sets add 10 ozs. quicksilver. Now stir the whole carefully, taking care not to breathe over it, as the fumes of the mercury are very pernicious. Pour this through an earthen pipe into the glass globe, which turn repeatedly round.

(30) R. S. S. asks: Is there any advantage in having the brake block in front of a wheel, or would it have as much power over the wheel if placed behind? A. There would be little, if any, difference.

(31) B. C. & Co. ask: How can I separate tin from dross? A. The tin is melted and the temperature raised very considerably in order to render the slag as liquid as possible, so that it may not retain too much tin with it. It is also necessary to stir the melted mass in order to facilitate the separation of the tin. The clay is then raked out, and the melted tin run into a cast iron pan: where it is allowed to remain for some time, in order that any slag may rise to the surface; after which it is skimmed, and poured into cast iron molds.

(32) E. F. H. asks: 1. Which are the best metals for large stencil plates? A. Thin hard brass is the best for this purpose. 2. Can acids be successfully used for this purpose? A. No.

(33) S. R. C. asks: In dyeing with aniline colors, what can we use to set the dye on cottons, woolens, and silks? A. Perkin uses tannin as a mordant for fixing the colors upon cotton and calicoes, working in an acid solution of the coloring matter. A basic lead salt may also be used as a mordant. In calico printing, the colors are usually mixed with albumen, which, by coagulation with steam heat, fixes the color on the fiber. Wool takes aniline dyes from their aqueous (but not acidulated) solutions readily at a temperature of 120° to 140° Fah. In the case of silk, all that is necessary is to steep it in the solution (the solvent being either alcohol or wood spirit) until the desired color is obtained.

(34) A. B. R. says: I have had 750 barrels of old cider on hand for three years. How can I turn it into vinegar? A. Add to each barrel a little fermenting substance, such as yeast or mother of vinegar.

(35) W. C. R. asks: I want to make oxygen gas in an iron quicksilver bottle. I want to screw on to it a cock and a nipple, and put a certain amount of chemicals into it, set it on the fire, and make the gas without letting it out of the bottle. In other words, I want to make a self-condensing gas cylinder. What amount of pressure will one of those bottles stand? Will 1 lb. chlorate of potash and 4 ozs. manganese yield too heavy a strain? I put in just half of the above quantities and screwed on the bottle a steam gage. It brought the gage up to 170 lbs., and would have gone higher, but I felt a little timid, and unscrewed the gage, and allowed the gas to escape. The bottle is 12 inches high and 5 inches in diameter, and about half an inch thick, outside measurement. A. As the volume of a gas is inversely as the pressure to which it is subjected, your bottle, with a pressure of 240 lbs. to the square inch, would hold a little over 2¼ cubic feet. The question is not what pressure the bottle will stand when cold, but with the bottom (in this case) necessarily heated nearly or quite to full redness. And as the rigidity of iron decreases rapidly as its temperature is raised, we are unable to give you the required figures. Your experiment was a very rash one, as many serious and some fatal accidents have occurred, to our knowledge, from like experiments. Besides, so small a quantity of gas (if used for the lime light) would last only a very short time.

(36) G. K. says: I want a cement that will harden in 48 hours or less, to be of the consistence of molasses. It is to be used to cement sandstone under salt or fresh water. A. Use Portland cement.

(37) E. E. S. asks: 1. What should be the relative diameters of the wheel on crank shaft, the pulley on saw arbor, and of the saw, in order to obtain the best effects in a foot power circular saw? A. We could not tell without knowing more particulars: but you will find a number of such machines in use, and you can observe their proportions. 2. Is there any advantage in placing a fly wheel on the saw arbor? A. The use of a fly wheel is advisable with such a machine. To your other question, there is a loss of power in the device you describe.

(38) G. L. N. asks: How can I deodorize kerosene oil? A. Digest it with chloride of calcium. This will leave it with a pleasant ethereal odor.

(39) L. D. M. asks: What can I size paper with, to prevent lard oil from striking through? A. Try dammar varnish.

1. What are the extra currents of electricity? A. If a closed circuit traversed by a voltaic current be opened, a scarcely perceptible spark is obtained, if the wire joining the two poles be short. Further, if the observer himself form a part of the circuit by holding a pole in each hand, no shock is perceived unless the current is very intense. If, on the contrary, the wire is long, and especially if it makes a great number of turns, so as to form a bobbin with very close folds, the spark, which is inappreciable when the circuit is closed, acquires a great intensity when it is opened, and an observer in the circuit receives a shock, which is the stronger as the number of turns of wire increases. 2. What causes the electric light, and why can it not be used for illumination? A. The heating of the poles is due to the great resistance which the electric current encounters at these points, the carbon composing which is converted into vapor by the intense heat, forming a conducting bridge across the gap, over which the luminous transfer of electricity takes place. 3. How does the core of an induction coil affect the induction current? A. It induces a current contrary to that passing in the primary wire at every breaking of the latter, which comes under the head of extra currents, explained above. 4. Has there ever been patented an automatic repeater with simply two relays? A. We think not.

(40) E. A. W. asks: What is absinthe? A A cordial of brandy, flavored with wormwood.

(41) R. G. asks: Can you give me a practical recipe for manufacturing potash? A. Caustic potash is generally procured by the action of caustic lime in a boiling solution of carbonate of potash. The lime unites with the carbonic acid of the potash, forming insoluble carbonate of lime, which subsides. The clear liquid, containing the potash in solution, is then drawn off and concentrated by evaporation. If the heat be continued to a point little short of redness, the liquid flows without ebullition, and may then be run into molds, where it solidifies on cooling, forming the small, grayish white sticks of commerce. The vessels used are either iron or silver.

(42) T. S. R. asks: Does it require more power to run a four-blade propeller than a two blade, the size being the same? A. Yes.

What is the best for an engine making 300 revolutions per minute, the propeller being 28 inches in diameter, and the engine 3½x5 inches? A. The four-bladed screw will utilize most of the power.

(43) W. M. asks: What ingredients will prevent the explosion of coal oil, and not impair the light when used in lamps? A. We can give you no better recipe than that of distilling off the lighter portions of the fluid until the specific gravity of the remaining portion is about 0·75 to 0·80.

1. How can I clean and polish window panes, mirrors, etc.? A. Take a small soft sponge, well washed from everything gritty, just dip it into water and squeeze it out again, and then dip it into some spirit of wine. Rub it over the glass, which immediately dust over with whiting sifted through muslin; rub it lightly and quickly off with a cloth, then take a clean cloth and rub it well again, and finish by rubbing it with a silk handkerchief. 2. How can I clean lacquered frames? A. Use a soft sponge and warm water. For paints, use soap and water. 3. How can I clean plated ware? A. Clean with hot water, followed by a solution of equal parts of spirits of ammonia and turpentine; and after this, if necessary, prepared chalk, whiting, magnesia, or rouge.

(44) F. E. M. asks: 1. What proportion to the periodic time of the heavenly bodies would be the time in which they would fall to the center of force, supposing the tangential force suddenly destroyed? A. The planets will reach the sun with the same velocity spirally as if they fell direct. 2. If two masses, each of which would attract to its center a body in one second at the distance of one foot, be placed two feet apart, would they meet in one second? A. No; they would meet in two seconds. 3. Professor Tait in *Good Words* speaks of the tridimensional character of space, and he mentions that mathematicians have speculated upon a fourth dimension. What mode is alluded to? A. This speculation reaches to serene hights where mathematics become lost in metaphysics and fog.

(45) M. C. R. asks: 1. How can I make an electromagnet? A. Wind insulated copper wire around the two ends of a bar of soft iron, bent into the form of a horseshoe. 2. About what weight would a magnet made of 10 lbs. wire be capable of raising, and what size of wire is the best? A. Coarse wire is the best for making magnets if the object is to raise heavy weights. The question as to how much a magnet containing 10 lbs. wire would be capable of raising could not be properly answered without stating how much battery is to be used.

(46) D. L. M. asks: 1. What is the difference between clock time and mean solar time, and why is there such a marked difference at particular times? A. The equation of time is the difference of the sun's true right ascension and mean longitude. 2. Is the direction of the earth's axis to its orbit always in the same direction? A. The direction of the earth's axis is nearly uniform.

(47) L. E. O. asks: Will an anode composed of nickel five cent pieces answer for nickel plating on a small scale? A. Yes.

(48) G. C. P. Jr. asks: 1. What is the best way to make a solution of rubber? A. By far the best solvent for rubber is bisulphide of carbon. 2. Is it safe to heat naphtha over a spirit lamp to boiling heat? A. No; the naphtha may be heated by immersing the vessel containing it in hot water or hot sand. This had better be done in the open air.

1. What is the best method to adopt in order to polish amber tortoiseshell? A. Use putty powder. 2. When is is faded, can it be restored to its natural color? A. It cannot.

Of what is fool's gold composed? Is it of any value? A. It is a compound of iron and sulphur, $Fe S_2$, and is of considerable value as a source of sulphur in the manufacture of sulphuric acid.

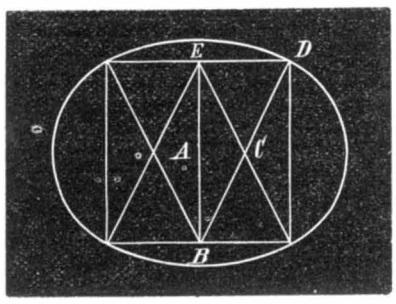
(49) C. D. H. asks: 1. In the construction of an induction coil 3 feet long, is it better to use a number of iron wires or a bar of iron for the core? A. Use a bundle of iron wires. 2. How large should it be? A. As long as the coil. 3. What size of copper wire should be used in the primary and secondary coils respectively? A. No. 4 in primary and 36 in secondary. 4. How should each be insulated? A. Cotton for primary and silk for secondary. 5. What is the best material for ends of the coil? A. This is immaterial. 6. What amount of battery would be required for a specific length of spark? A. Six cells will give a ten inch spark. 7. Would it do for an electric light? A. No.

(50) C. W. asks: 1. How can I make water colors in small cakes? A. Mix the colors into a thick paste with hot water containing a little gum arabic, and press into molds. 2. How can I make plumbago or black lead into cakes? A. Where pieces of sufficient size are obtainable, they may be sawn into the required shape. When in powder, it may be incorporated with a very small quantity of melted sulphur, or moistened with water and subjected to great pressure, when it coheres.

(51) W. L. D. asks: How can I make the linking rings which sleight of hand performers use? A: We are not acquainted with the manner in which these tricks are executed.

Can a person charge himself with electricity? A. Yes, by means of an electrical machine.

(52) H. C. N. says: I believe that the following method of drawing an oval is superior to many, and it draws a perfect oval. Take any



square, bisect it, and draw diagonals in the halves of the square. Describe the oval with the compass, using A, C, B, and E as centers.

(53) E. O. M. says: If N. P. B. will use the tang of an old mill saw file, he can turn his grindstone off true. When one side of the tang wears out, turn it over.

(54) T. W. D. says, in reply to J. H., who asked for a process in which to dye the skins of small animals, such as muskrat, mink, etc.? The green hull of the European walnut is turned to account in Europe for dyeing furs black, and the hull of our black walnut could probably be similarly employed. The walnut hull is crushed and the juice squeezed out from the pulp, with the addition of a little water. A small quantity of lime is added, and the dye is ready for use. The color is extremely difficult of extraction, and attaches itself very readily to any kind of hair, and it is used extensively as a hair dye. The coloring matter consists essentially of a soluble alkaloid lately investigated and known as regianine.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. F. H.—The tin has been acted upon by nitric acid of proper strength. The mineral is iron pyrites.—E. P. C.—It is black oxide of iron, mixed with quartz. It has too small a percentage of iron to be used as an ore.—G. S.—It is graphite or plumbago.—R. W. T.—It is iron pyrites, and (unless you find it in large quantities) cannot be made use of.—Y. M.—It is mispickel, and contains arsenic 46 per cent, sulphur 20 per cent, and iron 34. If you heat it strongly, the arsenic will be driven off with a disagreeable smell, and a piece of magnetic oxide of iron will remain.—A. E. J.—It is a secretion of carbonate of lime, and has no value. —J. D. B.—It is iron pyrites.—F. A. M. and O. E. F. —No. 1 is altered scapolite. No. 2 is white talc. No. 3 is aragonite. No. 4 is marcasite, or white iron pyrites. No. 5 is galena. No. 6 is asbestiform talc. No. 7 is a variety of talc. It may be used as a lubricant or to extract grease, or (when soft enough) as a French chalk. No. 8 is compact talc. No. 9 is talc. No. 10 is tremolite. No. 11 is ferruginous quartzite. No. 12 is chrysolite imbedded in volcanic tuff. No. 14 is iron pyrites in granite. No. 16 is an altered and decomposed pyroxene. No. 17. It is difficult from so small a fragment to decide whether it is pyrite or cobaltite. No. 18 is cupiferous amygdaloid. No. 19 is yellow oxide of iron. No. 20 is compound crystals, containing the cube, octohedron, and rhombic dodecahedron of iron pyrites.—I. F. D.—Nos. 1 and 2 contain some sulphuret of mercury, along with iron pyrites. From Nos. 3 and 6 we obtained no indications. No. 4 contained some iron pyrites in quartz; whether anything else were present could not be determined from the smallness of the amount.—G.C.R. —Both samples consist mostly of silex, with some alumina. The darker specimen was colored with oxide of iron. They both contained phosphoric acid, No. 2 having the larger percentage; and any fertilizing qualities which they possess are due to the presence of this constituent.—J. O'B.—No. 1 is magnetite, with some vitreous quartz, soda, felspar, and magnetic oxide of iron. No. 2 is lime, magnesia, and garnet. No. 3 is orthoclase. No. 4 is oligoclase. No. 5 is hornblende.—D. K.—Nos. 1 and 4 are sulphuret of iron in quartz and pyroxene. No. 2 is not an iron ore. It is a silicate of alumina, lime, and magnesia, with some oxide of iron, but not sufficient for extraction. No. 3 shows shining scales of biotite, a variety of mica, and the remainder is a mixture of quartz and felspar. No. 5 is not metal, as you say. It is a partly reduced sulphuret of iron, exceedingly brittle from presence of excess of sulphur.—H. W. F.—It is pyrrhotite or magnetic iron pyrites, and contains 39 per cent sulphur, 60 of iron, and traces of manganese and nickel.—F. M. S.—It is galena or sulphuret of lead, and contains 85 per cent of metallic lead.—E. J. M. —These specimens consist of carbonate of lime, and may have come from the skeleton or shell of some animal.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a New Numerical System. By F. E.
On the Sun's Orbit. By J. H.
On Stationary Engines. By J. C. G.
On the Currant Worm. By C. T.

Also enquiries and answers from the following.

F. P. M.—R. H. S.—J. T.—F. H. W.—N. B. D.—R. K. W.—J. T. P.—N. F.—R. S. W.—N. W. H.—F. H.—N. K.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who makes good washing machines? Whose is the best knife-cleaning machine? Who sells battery carbons? What are the prices of terrestrial globes? Whose is the best hominy mill? Who sells the best bone-crushing mill?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

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April 6, 1875,

AND EACH BEARING THAT DATE.

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17,798.—HARVESTER.—J. P. Manny, Rockford, Ill.
26,013.—GIRT BUCKLES.—L. C. Chase, Boston, Mass.
159,895.—IRON COLUMNS.—J. B. Cornell, New York city.

DESIGNS PATENTED.

8,257.—TOY MONEY BOX.—T. Bailey, Philadelphia, Pa.
8,258.—CARD CLIP.—G. W. McGill, New York city.
8,259.—BOOT TREAD.—F. Shaw, Braintree, Mass.

TRADE MARKS REGISTERED.

2,338.—PIG IRON.—Bay State Iron Co., Boston, Mass.
2,339.—PLATE METAL.—Bay State Iron Co., Boston, Mass.
2,340.—BAKING POWDER.—G. Gantz, New York city.
2,341.—SEWING MACHINES.—Grover & Baker Co., Boston, Mass.
2,342.—MOTH-PROOF FABRIC.—Hall *et al.*, New York city.
2,343, 2,344.—BITTERS.—W. H. Knoepfel, New York city.
2,345.—SPRING BEDS.—W. Lathers, New York city.
2,346.—SOAP.—C. Lipps, Baltimore, Md.
2,347.—SOAP.—McKeone & Co., Philadelphia, Pa.
2,348.—COLLARS.—Medberry *et al.*, Ballston Spa, N. Y.
2,349.—TOBACCO.—C. R. Messinger, Toledo, O.
2,350.—COD LIVER OIL.—P. Möller, London, England.
2,351.—COTTON SHEETINGS.—Monohansett M'f'g Co., Putnam, Conn.
2,352.—RUBBER GOODS.—National Rubber Co., Bristol, R. I.
2,353.—OINTMENT.—Ostrander & Son, Watsonville, Cal.
2,354.—MUSTARD.—A. A. Plastridge, Chicago, Ill.
2,355.—GRAY CLOTH.—L. Pomeroy's Sons, Pittsfield, Mass.
2,356.—MEDICINE.—W. Renne & Sons, Pittsfield, Mass.
2,357.—SHIRTS.—Stern & Co., New York city.
2,358.—MEDICINE.—J. D. Watties, New York city.
2,359.—SUSPENDERS, ETC.—J. W. Wattles, Canton, Mass.
2,360.—COOKING STOVES.—Fuller & Co., Troy, N. Y.
2,361.—OIL.—Simons & Bro., Philadelphia, Pa.

SCHEDULE OF PATENT FEES.

On each Caveat..... $10
On each Trade mark..... $25
On filing each application for a Patent (17 years)..... $15
On issuing each original Patent..... $20
On appeal to Examiners-in-Chief..... $10
On appeal to Commissioner of Patents..... $20
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On filing a Disclaimer..... $10
On an application for Design (3½ years)..... $10
On application for Design (7 years)..... $15
On application for Design (14 years)..... $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, APRIL 1 to 9, 1875

4,558.—J. Borer, West Flamboro, Ont. Cultivator. April 1, 1875.
4,559.—W. S. Tarrie, Moncton, N. B. Soap. April 5, 1875.
4,560.—F. Rourk, Montreal, P. Q. Ventilating sewers and mines. April 5, 1875.
4,561.—Wm. T. Root *et al.*, Ingersoll, Ont. Boiler magazine. April 5, 1875.
4,562.—G. McEwan, Derby, Vt., U. S. Milk pan discharge tube and stopple. April 5, 1875.
4,563.—G. A. Beidler, Philadelphia, Pa. U. S. Lamp burner. April 5, 1875.
4,564.—W. H. W. Sheppard, Newmarket, Ont. Heating stove. April 5, 1875.
4,565.—J. W. Beaumont, Petrolia, Ont. Artificial coal. April 5, 1875,
4,566.—F. P. Peace, Marysville, Tenn., U. S. Breech-loading fire arm. April 5, 1875.
4,567.—L. M. E. Raveaud *et al.*, New Orleans, La., U. S. Heating stove. April 5, 1875.
4,568,—W. J. Wilson, Chicago, Ill., U. S. Preserving and packing cooked meat. April 5, 1875.
4,569.—L. Coté, St. Hyacinthe, P. Q. Heel stiffener shaping machine. April 5, 1875.
4,570 —G. W. McCready, Petitcodiac, N. B. Perpetual calendar and pen holder. April 5, 1875.
4,571.—F. M. Willson *et al.*, Hamilton, Ont. Lamp holding attachment for sewing machine. April 5, 1875.
4,572.—A. Woods *et al.*, Liverpool, England. Life saving appliance for sea use. April 5, 1875.
4,573.—J. Forsyth, Dundas, Ont. Mower and reaper lifter and clutch. April 5, 1875.
4,574.—I. R. Hayes *et al.*, Manchester, England. Self-adjusting umbrella. April 5, 1875.
4,575.—S. S. Arnold, Dresden, Ont. Combination bed lounge. April 5, 1875.
4,576.—H. Taylor, Richmond Hill, Ont. Lamp. April 5, 1875.
4,577 and 4, 578.—C. D. Bigelow, Brooklyn, N. Y., U. S. Screw soling machines. April 6, 1875.
4,579.—H. Wandby, Toronto, Ont. Gypsum kiln and baker's oven. April 6, 1875.
4,580.—J. B. McCormick, Armagh, Pa., U. S., *et al.* Turbine water wheel. April 6, 1875.
4,581.—C. W. Clements, Yarmouth, N. S. Clip-jib hank. April 6, 1875.
4,582.—J. Dryland, Hamilton, Ont. Anti-grease attachment for cooking stoves. April 6, 1875.
4,583.—S. K. Paige *et al.*, Henniker, N. H., U. S. Box machine. April 6, 1875.
4,584.—J. T. McNally, Brooklyn, N. Y., U. S. Bran picker and duster. April 6, 1875.
4,585.—J. S. Bonter, Blairton, Ont. Quilting frame. April 6, 1875.
4,586.—E. Horsey, Kingston, Ont. Pump. April 8, 1875.
4,587.—P. Nicalle, Lindsay, Ont. Beehive. April 8, 1875.
4,588.—B. H. Davis, Foxcroft, Me., U. S. Stump and rock lifter. April 8, 1875.
4,589.—T. N. Egery, Bangor, Me., U. S. Water wheel. April 8, 1875.
4,590.—S. J. Lundy, Uxbridge, Ont. Plow protecting draw clevis. April 8, 1875.
4,591.—E. D. Reynolds *et al.*, Brockton, Mass., U. S. Bag. April 8, 1875.
4,592.—F. Dagenais *et al.*, Montreal, P. Q. Rock drill. April 8, 1875.
4,593.—J. Battersby, Ingersoll, Ont. Portable steam boiler. April 8, 1875.
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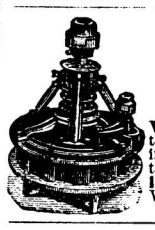

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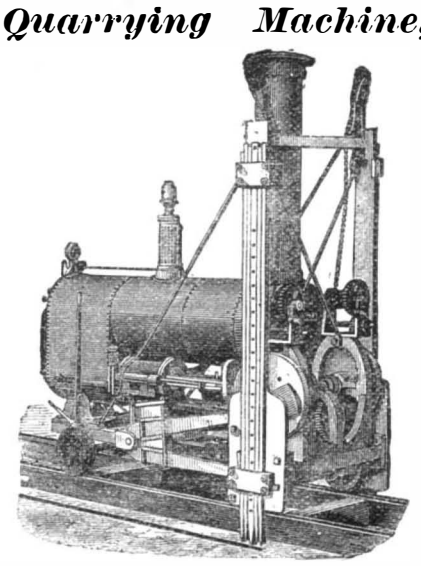

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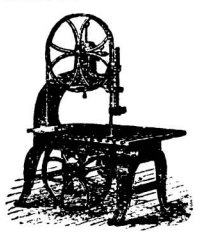

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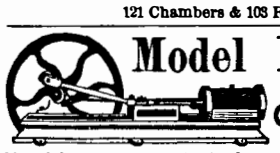

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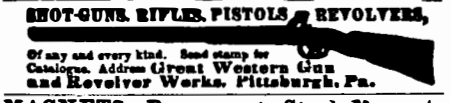

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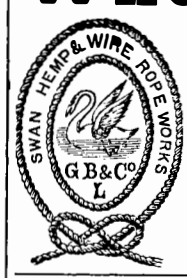

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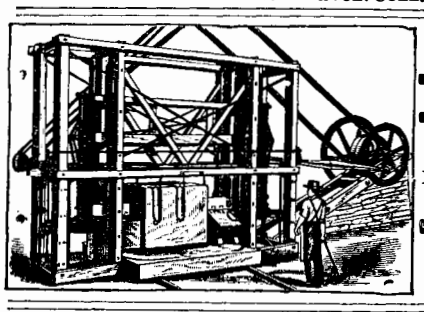

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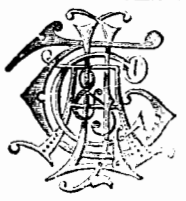

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